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ABSTRACT

The Wilderness Curriculum is designed to provide classroom teachers, land managers, and outdoor educators with an interactive resource to promote awareness and appreciation of the cultural, environmental, and experiential values of wilderness. The curriculum is divided into three grade levels (Primary, K-2; Elementary, 3-5; and Middle, 6-8); each level is composed of an overview section and five strands, from which lessons and activities follow: Overview (the "who, what, where, and why" of wilderness); Aesthetics (the spiritual, cultural, and emotional values of wilderness); Perspectives (the historical context of wilderness); Ecology (the role of wilderness in preserving natural systems); Connections (connections between our culture and wilderness); and Skills (low impact use and living that promotes wilderness integrity). Dimensions of each major strand in the curriculum are explored through several lessons that are cross-referenced by grade level and strand. Lessons and activities include objectives, background information, materials needed, and procedures. Many activities contain reproducible student handouts. Contains a further reading list and a glossary. (BT)

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the WILDERNESS & LAND ETHIC CURRICULUM

SO 032 568

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KINDERGARTEN THROUGH 8TH GRADE
SECOND EDITION

Arthur Carhart National Wilderness Training Center

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Arthur Carhart National Wilderness
Training Center

"Fostering interagency excellence in wilderness stewardship"

The Wilderness & Land Ethic Curriculum

Kindergarten Through 8th Grade

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Wilderness Training Center
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1999

The Carhart Wilderness Training Center is a United States federal government inter-agency training center devoted to training federal and state land managers who have wilderness management responsibilities; however, we have also developed school curricula on wilderness for primary and secondary education levels. Our staff are representatives from the 4 federal wilderness land managing agencies, which are the Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service and the U.S. Forest Service.

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WILDERNESS BACKGROUND

Lesson	Page	Grade Level	Strand
Wilderness Act History	127	E	Perspectives
Where Is Wilderness?	215	M	Overview
Personalities and Philosophies in Wilderness Preservation	253	M	Perspectives

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Lesson	Page	Grade Level	Strand
Introduction to Wilderness	47	P	Overview
Once Wild	57	P	Perspectives
The Wilderness Wildbook	89	P	Skills
Introduction to Wilderness	105	E	Overview
Living in the Wilderness	119	E	Perspectives
Introduction to Wilderness	209	M	Overview
Wilderness Time Line: The Long and Short of It	241	M	Perspectives
Historical Perspectives	245	M	Perspectives

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Lesson	Page	Grade Level	Strand
Wild Wise	51	P	Aesthetics
Sensory Awareness in Wild Nature	109	E	Aesthetics

PERSONAL VALUES

Lesson	Page	Grade Level	Strand
Natural Resource Values	109	E	Aesthetics
Perspectives of Wilderness	219	M	Aesthetics
Where Do You Stand?	227	M	Aesthetics
Wilderness Values	233	M	Aesthetics
My Side of the Mountain	237	M	Aesthetics
Wild By Law	261	M	Perspectives

LESSON CROSS-REFERENCE TABLE

WILDERNESS ETHICS

Lesson	Page	Grade Level	Strand
Wilderness Impacts	79	P	Connections
Leave No Trace	191	E	Skills
Leave No Trace	341	M	Skills

WILDERNESS MANAGEMENT

Lesson	Page	Grade Level	Strand
Wilderness Management	297	M	Connections
Wilderness Decision-Making	347	M	Skills

WILDLIFE

Lesson	Page	Grade Level	Strand
What Is Wild?	61	P	Ecology
Creative Movement for Wildlife Species	73	P	Ecology
Introduction to Skulls	147	E	Ecology
Stories From a Skull	265	M	Ecology

ADAPTATIONS

Lesson	Page	Grade Level	Strand
Habitadaptations	65	P	Ecology
Adaptations and Habitats	129	E	Ecology

ECOLOGICAL RELATIONSHIPS

Lesson	Page	Grade Level	Strand
Community Connections	141	E	Ecology
Words From the Lorax	155	E	Connections
Ecosystems	277	M	Ecology
Fire's Role in Wilderness	279	M	Ecology

AIR AND WATER

Lesson	Page	Grade Level	Strand
Wild Air/City Air	159	E	Connections
Wild Water	163	E	Connections
Acid Rain and Wild Places	287	M	Connections
Water: Wet and Wild	293	M	Connections

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Lesson	Page	Grade Level	Strand
Wilderness Skills	83	P	Skills
Basic Map Skills	177	E	Skills
Wilderness Rations Planning	181	E	Skills
Wilderness Fabrics and Clothing	185	E	Skills
Wilderness Decision-Making & Group Dynamics	199	E	Skills
Keys to Understanding	269	M	Ecology
Basic Map and Compass	303	M	Skills
Wilderness Nutrition and Cooking	329	M	Skills
Wilderness Equipment Selection and Use	337	M	Skills

INTRODUCTION

WELCOME TO THE WILDERNESS CURRICULUM!

The National Wilderness Preservation System totaling approximately 104 million acres and consisting of 630 individual Wilderness units, is under the jurisdiction of four land management agencies; three in the Department of Interior and one in the Department of Agriculture. The National Wilderness Preservation System was established with the passage of the Wilderness Act in 1964. The Wilderness Act begins with these prophetic words:

> *In order to assure that an increasing population, accompanied by an expanding settlement and growing mechanization, does not occupy and modify all areas of the United States...leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness.*

The Wilderness curriculum is designed to provide classroom teachers, land managers and outdoor educators with an interactive resource to promote awareness and appreciation of the cultural, environmental, and experiential values of wilderness.

The Wilderness curriculum is divided into three ranges of grade levels. Each level is composed of an overview section and five strands, from which lessons and activities follow:

OVERVIEW
The "who, what, where, and why" of wilderness

AESTHETICS
The spiritual, cultural and emotional values of wilderness

PERSPECTIVES
The historical context of wilderness

ECOLOGY
The role of wilderness in preserving natural systems

CONNECTIONS
Connections between our culture and wilderness

SKILLS
Low Impact use and living that promotes wilderness integrity

INTRODUCTION

STRUCTURE

Dimensions of each major strand are explored through several lessons. Some lessons contain several different but related activities. Thus, the curriculum is organized in three components: the three grade levels of this curriculum are Primary (kindergarten through second), Elementary (third through fifth grades, and Middle (sixth through eighth). Each grade level has lessons and activities, that correspond to the six strands.

STRAND
LESSON
ACTIVITY

The lessons follow a sequence or progression which we suggest you follow. Grade level lessons are divided into strands. Concepts within a strand often build on those of the previous age group. Thus it is helpful to review previous lessons as background for your age group. Lessons for older grade levels may provide extension activities for your students. Each lesson has the strand symbol located in the page corner under the strand name and age level. Please see the Goal Matrix on page 7 and the strand charts at the beginning of each grade level section.

This curriculum package is designed with the idea that teachers can work cooperatively to plan and carry out a "Wilderness Week." Many subjects are addressed in the curriculum, but all have a clearly identifiable link with wilderness. Therefore, classes in history, language arts, science and physical education might all focus on wilderness for one day or even a full week.

Teachers have also found some success integrating lessons from a particular strand into a related curriculum that they have taught. However, we encourage teachers to use the lessons to teach about wilderness specifically, and to begin with the introductory OVERVIEW section.

THE BOX

The materials we have identified for inclusion in the Wilderness and Land Ethic Box, are listed on Page 9. They are intended to provide instructors with a variety of resources from which they may creatively share information about wilderness. **Materials available in the box are referenced by a 🐻.** The skulls, skins, rock collection, and "feely bag" are specimens from nature that provide opportunities for hands-on learning. The puppets, intended especially for young students, may be used in creative and dramatic ways to convey wild concepts. Maps and posters may be displayed in your classroom and are associated with lessons in the curriculum. The slide show and videos provide insights through visual media into wilderness-related concepts and skills. Beautifully illustrated picture books, a novel, and informational resources embody wilderness values and facts.

There are lots of good ideas out there already! We acknowledge that fact by the inclusion of many existing materials and activities in the box. What the Wilderness and Land Ethic Box presents is a new interdisciplinary curriculum focused on **wilderness.** These materials make both the learning and teaching about wilderness a truly rewarding experience.

DEFINING WILDERNESS

Rod Nash, wilderness historian, tells us that wilderness is a difficult word to define. While the word is a noun, it acts like an adjective. There is no specific material object that is "wilderness". There is no universal definition of wilderness. He believes that wilderness is so heavily weighed with meaning of a personal, symbolic, and changing kind that it is difficult to define.

In early Teutonic and Norse languages, from which the English word developed , the root word, "will" meant "self-willed, willful, or uncontrollable." From "Willed" came the adjective "wild" used to convey the idea of "being lost, unruly, disordered or confused." Applied initially to human conduct, the term was extended to wildlife or wild animals as "being out of control of man." Other Europeans defined wilderness as "deserted places" and "lacking of cultivation." The idea of a habitat of wild beasts implied the absence of men, and wilderness was conceived as a region where a person was likely to get into a "disordered, confused, or wild condition."

Even in today's dictionaries, wilderness is defined as uncultivated and otherwise undeveloped land. The absence of men and the absence of wild animals is a common, modern-day perception. The word also designated other non-human environments, such as the sea and, more recently, outer space. The usual dictionary meaning of wilderness implies "hostility on man's part," but the term has also developed positive meanings. On one hand, wilderness is "inhospitable, alien, mysterious, and threatening." On the other, "beautiful, friendly, and capable of elevating and delighting us."

Today, some define wilderness as a sanctuary in which those in need of consolation can find respite from the pressures of civilization. Bob Marshall, champion for wilderness, demanded an area so large that "it could not be traversed without mechanical means in a single day." Aldo Leopold, wilderness visionary, set his standard as an area's ability to "absorb a two weeks' pack trip."

A century-old movement to protect wild country reached it's peak moments in time with the creation of a National Wilderness Preservation System, passed into law by Congress as the Wilderness Act of 1964. According to it's authors, the Wilderness Act defined wilderness, "in contrast with those areas where man and his own works dominate the landscape, as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The act went on to require that a wilderness retain "its primeval character and influence" and that it be protected and managed in such a way that it "appears to have been affected primarily by the force of nature."

Some Native American cultures do not have a word for wilderness or protect land as officially designated wilderness. They believe all land should be respected and all land is used only for survival, whether it be physical, spiritual or mental. If asked, we all have a different and unique definition for what wilderness means to us.

Credit: Wilderness and the American Mind, Roderick Nash, Yale University Press, 1982.

INTRODUCTION

Wilderness/wilderness

In this curriculum we have used wilderness and Wilderness throughout the test. We have distinguished between the two by using wilderness to denote the concept of wilderness, wild lands, and wild places. When Wilderness is used, it is referring to federally designated lands that have been passed into law by Congress as designated Wilderness. These lands are included in the National Wilderness Preservation System, managed by the Forest Service, National Park Service, Bureau of Land Management, and the Fish and Wildlife Service.

SUPPLEMENTAL INFORMATION

You will find in the beginning of this curriculum a background section which is helpful for instructors and students to use with various lessons. It provides a broad overview of Wilderness focusing on an historic timeline, values, issues, resource agencies, land classifications and laws related to management. We encourage you to become familiar with this section and use it whenever possible. A glossary, list of references, and index can be found at the end of the curriculum.

ACKNOWLEDGMENTS

Contributor:

Primary credit for information found in this publication goes to Mary Beth Hennessy, Pike San Isabel National Forest; David Cockrell, University of Southern Colorado; Linda Marr, Vashon Public Schools; and Kari Gunderson, Gunderson/Flood Wilderness Partnerships. Other contributors include Michele Van Hare, Arapahoe Roosevelt National Forest; Sharon Kyhl, Pike San Isabel National Forest; Sally Blevins and Rebecca Cothran, Bitterroot National Forest; Joy Jolson and Lisa Therill, Wenatchee National Forest; Jeanne Moe and Kelly Letts, Bureau of Land Management; and Clifford Knapp, Northern Illinois University. Mary Beth Hennessy deserves special recognition for developing curriculum, conducting teacher workshops and for her enthusiasm and dedication to wilderness education. David Cockrell and Kari Gunderson are likewise acknowledged for their dedication to this project. Linda Marr contributed her expertise as an elementary teacher and spent countless hours on this project. Many teachers in Colorado, Forest Service wilderness managers and interested organizations have been involved in pilot testing this curriculum, revisions, and teacher workshops. Marsha Kearney and Lance Tyler of the Pike San Isabel National Forest deserve special recognition for their support and enthusiasm for this project. Contributing representatives from The Wilderness Education Council of Colorado, Wilderness Education Association, Colorado Outward Bound School, Wetlands and Wildlife Alaska Curriculum, National Wildlife Federation, Project Wild, Project Learning Tree, Natural Resource Conservation Education and the Wilderness Education Working Group greatly enhanced this publication. Artwork for the cover pages and cover were creatively designed by Susan Sprague, Wallowa Whitman National Forest; Eve Ponder, Wenatchee National Forest and Bob Zingmark from Missoula, MT.

Compilers

Contents for this publication came from numerous authors and took various forms. Some materials were sent electronically, some hard copies were provided, and others were in diskette form. Converting the resources used in this publication to consistent format was an involved and laborious process. Dawn Chase, Dave Cornell and Mike Cronin displayed considerable patience, persistence and enthusiasm.

Supporters

In addition to daily duties, Ninemile Ranger District employees strongly supported this and other National Wilderness projects. Their willingness to lend a hand was invaluable. Special thanks to Lynne Sholty, Pat Perry and Laurie Kreis for responding quickly, efficiently and creatively to purchasing and contracting, computer requests, and box component ordering and development. Thanks to Jerrie Bullock for administrative support, and to Rachael Koke for copying and typing requests. Flannel boards, poster lamination, wild cards are just a few of the box components that Jim and Jeri Davis, Visitor Center Volunteers and Maureen Park helped develop.

For their vision of excellence in wilderness management and their genuine support of this project, special thanks are extended to John Twiss and Jerry Stokes, Forest Service National Wilderness Group leaders; Keith Corigall, Wes Henry and Pete Jerome, National Wilderness Leaders from the BLM, NPS and USF&WS; Regional Forest Service Wilderness Specialists: Liz Close, Steve Morton, Lee Carr, Ron Bradsby, Ruth Monahan, Tommy Baxter, Margaret Petersen, Larry Phillips, Gaylord Yost and Arn Albrecht.

The Second Edition

This Second Edition of the K through 8 Wilderness Curriculum was revised and updated by Chris Ryan and Greg Kroll of the Arthur Carhart National Wilderness Training Center, with assistance from David Mensing, Bureau of Land Management, New Mexico.

The changes made in this edition are the direct result of the many suggestions and insights provided by the users of the original curriculum. To the extent that the Second Edition better serves educators, students, and the wilderness itself, credit goes to all of you who provided us with feedback.

Connie G. Myers

Director
Arthur Carhart National Wilderness Training Center

FORWARD TO THE PRESENT EDITION

This Second Edition of the *Wilderness and Land Ethic Curriculum* is **not** a major revision of the original. As the popularity of the original curriculum depleted our stock and called for a reprinting, we decided to correct textual errors and make the document more user-friendly by adding an index and cross-references. Cross references are displayed in the lesson cross-reference table, pages xviii-xx and listed under "**See also**" in each lesson.

We also sought to make the curriculum more national in scope. The original publication borrowed heavily from the outstanding activities developed by environmental educators throughout the West, especially Colorado. Short of rewriting significant sections of the curriculum, we have tried to make many activities more applicable nationwide. Those lessons that are still centered around Rocky Mountain ecosystems can be easily adapted to fit ecosystems anywhere in the country; they have been left in the curriculum as excellent examples that will spark your own creativity.

The many, many hours of effort that went into the creation of the original curriculum and its revision are a testament to the heartfelt belief in the value of wilderness held by so many of you. As you utilize this shared effort and instill the understanding it provides into your students, may you, too, be touched by "the lonely places on the face of Mother Earth," as Aldo Leopold wrote, "where all her ways are pleasantness, and all her paths are peace."

FORWARD TO THE FIRST EDITION

Background

This curriculum has evolved over a three year period. It was initially developed by individuals in the Rocky Mountain Region of the Forest Service, in Colorado. This version is the product of many teachers, Forest Service wilderness managers and interested organizations. Mary Beth Hennessy, Linda Marr and David Cockrell are the main contributors.

The curriculum has been pilot tested in Colorado through teacher workshops in the urban areas of the state. In 1993, the Arthur Carhart National Wilderness Training Center was directed by their steering committee to take the Rocky Mountain Region Wilderness Box and develop it for national distribution.

With help from Kari Gunderson and countless others, we edited, revised, and reformatted the K-8 curriculum and developed the box components to be more generic and national in scope. The curriculum activities and lessons are tied to a collection of instructional aids including skulls, skins, puppets, maps, books and videos known as the "Wilderness Land Ethic Box."The Training Center has provided "starter kit Wilderness Land Ethics Boxes" for all Forest Service regions and other agencies in the National Wilderness Preservation System.

The goal of this project is to develop an awareness of the wilderness resource and its significance to our culture and society. It is designed for use in urban classrooms without dependence on any "field experience" (many are adaptable to a field setting.)

Through continued partnerships and collaboration of all those interested in forwarding this educational tool, this project will flourish and the land resources will benefit.

Improvements

As with many efforts there is undoubtably room for improvement. We look forward to ideas, suggestions, and evaluation of this project with the hope that Wilderness will become recognized as a significant aspect of our country's culture, ecological health and future.

LESSON CROSS REFERENCE TABLE

A GOALS MATRIX FOR THE WILDERNESS CURRICULUM

—STRANDS—

	Overview	Aesthetics	Perspectives	Ecology	Connections	Skills
Primary (K-2)	To gain a general understanding of wilderness as a place predominantly influenced by the forces of nature To be able	ate sensory awareness as a means of enjoying and learning about wild nature To experience	even the places where we now live were once wild To be able to generally place the	their wild habitats To understand food chains and interrelationships	environments To gain an awareness of the direct impacts of litter and air and water pollution on	wild lands To begin to gain skills in outdoor cooking, map use, clothing selection, safety and leave no trace
Elementary (3-5)	to describe some attributes of wilderness, and know that wilderness lands must be preserved and managed	personal aesthetic values from wilderness and wild things through writing, drawing, and other creative activities To gain	wilderness preservation movement in the context of history and personal history To understand geological	between biotic and abiotic components of wild environments To have understanding of patterns,	wilderness and the need for wise use of resources To become aware of the specific geographic connections between urban com-munities	To gain specific skills necessary for responsible and enjoyable backcountry travel and living
Middle (6-8)	To have basic knowledge of who preserves and manages wilderness, why it is preserved, and how To appreci-	awareness of societal aesthetic values placed on wilderness through literature and art To understand that	history, westward expansion, and the environmental preservation movement as perspectives on wilderness To understand connections between wildlife and	relationships and natural cycles relating to healthy ecosystems To understand the effects human actions can have on wild	and wilderness as well as management options for wild lands To understand that special materials and skills are necessary for safe and ethical recreation in	

WILDERNESS BOX MATERIALS

Books

____ Wilderness America: 25 Yrs
____ My Side of the Mountain
____ NOLS Wilderness Cookery
____ Signs Along the River
____ Sharing Nature With Children
____ The Lorax
____ Lost Lake
____ Wilderness Visionaries
____ The First 75 Years (NPS)
____ Public Lands, Public Heritage:
____ The National Forest Idea
____ Centennial Mini Histories of the Forest Service
____ Words for the Wild
____ A River Ran Wild
____ Living Treasure
____ The Last Bit Bear
____ The Book of Fire
____ Audubon Bird Pocket Guide
____ The Other Way to Listen
____ 1 book in State Heritage Series
____ Zoobooks (2)
____ Quote Book
____ National Geographic Handbook
____ Sand County Almanac

Maps & Posters

____ Wilderness Wolf Poster
____ Nat. Wild Preservation System
____ 30th Anniversary Poster
____ Agency Maps
____ Leave No Trace Poster
____ Fire Poster
____ State Wilderness Map
____ State Map
____ Outdoor Skills Posters (9)
____ Water Cycle Poster

Skulls & Pelts

____ Beaver Skull
____ Bobcat/Lynx Skull
____ Coyote Skull
____ Pelt

Videos, Tapes & Miscellaneous

____ Leave No Trace/Soft Paths-Video
____ A Kid for the Wild-Tape
____ The Green Scene-Video
____ Wildlife Postcards (12)
____ Compass (6)
____ Wild by Law Video
____ National/State Wilderness Slides (65)
____ Animal Slides
____ Wild Bag
____ Wolf Transparency
____ The Last Parable Video
____ A Kid for the Wild-Song Sheet
____ Five Puppets
____ Flannel Board - pieces
____ Contour Plastic Mountain Kit
____ Rock Collections and Box
____ Oh Wilderness Card Game
____ Battle for Wilderness Video

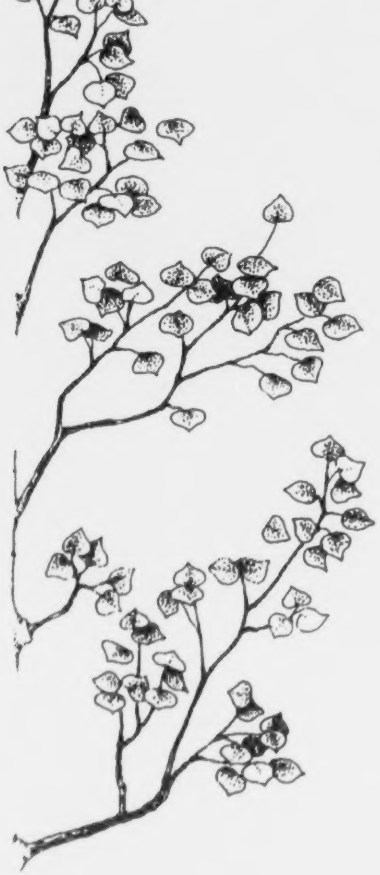
Curricula & Pamphlets

____ The Green Scene Curriculum
____ Leave No Trace Skills & Ethics Booklets
____ Wilderness Box Curriculum
____ Leave No Trace Educational Materials Catalog
____ Woodsy Owl EE Kit
____ Wild. Mgmt. Philosophy in RM
____ Women in Natural Resources 1990

INTRODUCTION

In the appendix is a Wilderness Box materials description list, a vendor list and flannel board contents list.

Please refer to these lists when you order additional materials or replacement supplies.



WILDERNESS BACKGROUND

WILDERNESS: WHAT IS WILDERNESS?

The most frequently asked questions about this thing called wilderness:

What Is Wilderness?

Wilderness is a place where the imprint of humans is substantially unnoticed. It is where natural processes are the primary influences and human activity is limited to primitive recreation and minimum tools. This allows us to experience wild places without intention to disturb or destroy natural processes. Change will occur primarily through natural disturbance, and minimum human influence.

Is It A Law?

YES. In 1964 the Congress of the United States passed the Wilderness Act, restricting grazing, mining, timber cutting and mechanized vehicles in these areas. They are protected and valued for their ecological, historical, scientific and experiential resources. The law protects these values for future generations.

Who Manages Wilderness?

The National Wilderness Preservation System is managed by the National Park Service, Forest Service, Fish and Wildlife Service and the Bureau of Land Management. Wilderness, designated by Congress, is one layer of protection, placed on top of original federal land designation.

Although federal agencies are legally responsible for managing Wilderness areas, all citizens have a role and responsibility. As visitors, your behaviors and actions should be appropriate. As citizens, we should be aware of the impacts of our lifestyles on our country's wild lands.

Why do we have to manage a Wilderness?

Wilderness management is essentially the regulation of human use and influence in order to preserve the quality, character and integrity of these protected lands. We all must be aware of our impacts. As individuals our choices and consumption of resources may in some way degrade wilderness values such as ecological health, solitude and aesthetics.

We are managing for future generations, committing to having places that remain undisturbed for centuries, not just decades. In order to keep Wilderness wild, we need to ensure that our social and individual practices, both inside the Wilderness and outside, do not cause changes that will erode the resource.

What are the threats to Wilderness?

There are many issues in Wilderness. What is a minimum tool? What is primitive? What is Wilderness character and integrity? What is solitude? How do we manage threats, like air pollution, that are outside Wilderness? In many cases, societal pressures have the most significant affect upon wildland resources. Resource managers are discovering the significant connection between society and Wilderness. For instance, pollution sources in cities can disturb plant and aquatic life in seemingly distant and separate Wilderness lands.

The ecological as well as recreational values of Wilderness must be maintained in preserving Wilderness. With economic growth exerting pressures of a growing population, agencies are observing many of these potential threats to the Wilderness resources including:

- Loss of character, quality and integrity of Wilderness.
- Loss of or threats to biological/ecological processes and biodiversity, through human distrubance.
- Soil compaction, vegetation loss or disturbance and replacement by non-native species such as noxious weeds, on trails and campsites caused by heavy recreation use.
- Crowding, loss of solitude.
- Deterioration of water quality from improper disposal of human waste and waste water.
- Air pollution from outside sources.
- Interruption of natural functioning ecosystems by fire suppression.
- Threats to native plant species from the spread of noxious weeds from sources outside Wilderness.

So What Can I Do?

Everyone has a role in protecting and managing Wilderness. Through your vote, your lifestyle and your actions while visiting Wilderness, you can help reduce these threats to wild areas. Contact your local Forest Service Ranger District, Park headquarters, BLM Resource Area or Refuge Manager for more information.

WHY WILDERNESS?

Some thoughts about preservation...

The preservation of wild lands is uniquely American. Our first contact with the "New World" exposed us to the rich culture of the American Indians and their intimate knowledge of the natural world. Toward the end of the 19th century and the end of the frontier era, forward-looking individuals such as John Wesley Powell, John Muir and Gifford Pinchot contributed to a conservation of public lands. They and others recognized that resources were limited and settling the West, with an economic base of natural resources, required conservation practices. Arguments were made for the preservation of land for non-extractive purposes, and laws were passed that today leave us with a precious treasure of undisturbed wild lands.

Through recent history, Western European cultures and traditions have maintained a distinct separation between the land and our human existence. Many people are beginning to see the connections, beginning to see that we cannot separate ourselves from the land. Humans are a part of the natural world, not apart from it, and our style of living has effects upon the health of the bigger global environment.

The preservation of wild lands has many values. Recognizing these diverse and unique values opens a world of understanding about the natural world. Preserving Wilderness may someday be seen through eyes of historians as the most important contribution societies can make to the health of the global environment. Here are some of those values.
Together, they show how rare and valuable our wild lands are.

Reservoirs of Biological Diversity

> "The outstanding scientific discovery of the Twentieth Century is not the television, or radio, but rather the complexity of the land organism. Only those who know the most about it can appreciate how little is known about it. "
>
> —Aldo Leopold, *A Sand County Almanac* (1949)

Wilderness is one part of the "land organism". Wilderness plays a significant role in the overall health of ecosystems. Rare and endangered plant and animal species require habitats that are relatively undisturbed so gene pools can be sustained, adaptations made, and populations maintained. Many rare and endangered species are indicators of ecological health, or they may play key roles in the balance of the ecosystem. Natural disturbance, like floods or fires, maintain natural processes, systems, and patterns. Few places are left where rivers, flood and trees are allowed to burn in natural cycles. Wildness is the heart of the "land organism".

Scientific Value

Wilderness serves as a unique and irreplaceable "living laboratory" for medicinal and scientific research. Wilderness also protects geologic resources. Undisturbed, naturally occurring geologic phenomena are protected for present and future generations so they may pursue the origin of this planet and the universe.

Watersheds

Many Wildernesses are the headwaters of our rivers and water systems. These watersheds provide sources of clean water. Minimal human activity or development in these areas preserves waters for future generations. Without clean water, societies cannot flourish. The connection between our Wildernesses and our cities is most evident with water, our basic resource.

Life Support Systems

Wilderness serves as critical habitat for animal and plant life. Wilderness maintains gene pools to provide diversity of plants and animal life. Today, as we learn more about the greenhouse effect and the depletion of the ozone layer, more and more people realize that humanity is part of an interconnected "web of life," and that the survival of our own species may ultimately depend on the survival of natural areas.

Historic and Cultural Values

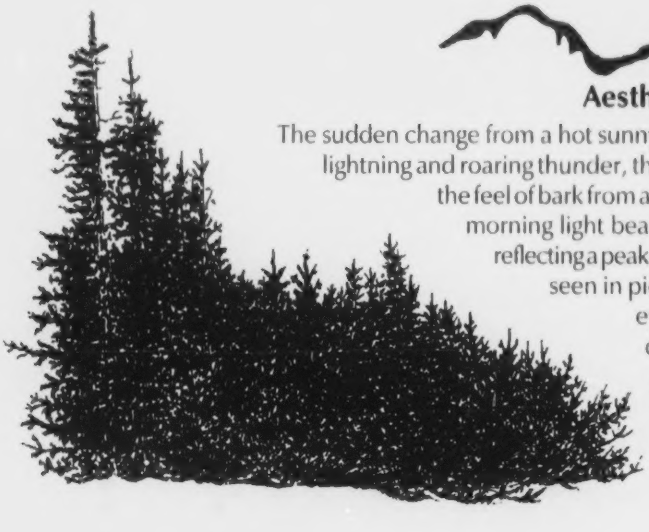
Wilderness is a unique repository for cultural resource. Artifacts and structures protected by the Archeological Resources Protection Act or other laws take on a new perspective when experienced within the context of the Wilderness. These features tell a valuable story about the human relationship with wildlands.

In addition, culture has been defined by wilderness. Our American values of freedom, ingenuity and independence have been affected by the wild environments from which we created societies. Wildness has been a part of America since its beginnings. For this reason, Americans have a special attraction to wildness.

Spiritual Values

The spirit of the land can be understood through the Judeo-Christian tradition, the Zen, the Buddhist or simply an individual's connections through experience. These wild lands offer opportunities for reflection, for observation, for explorations of the ideas and experiences that can only be found in our wild areas. They have become churches of sorts, for our personal growth and our understanding of the relations between humans and the land.

Aesthetic Values



The sudden change from a hot sunny day to a powerful storm exploding in lightning and roaring thunder, the delightful sound of a trickling stream, the feel of bark from a thousand year old Bristlecone pine, the morning light beaming on cliffs and ridges; a glassy lake reflecting a peak. These are moments we cherish, whether seen in picture books or movies or with our own eyes. Call it beauty. Humans are enchanted by nature. We are not in control. We are participants. This is the aesthetic of Wilderness that has a special value.

Recreation

Many people enjoy traveling in Wilderness areas for the challenge or the pure joy of such an experience. Values such as self reliance are particularly important. You are responsible for yourself. Your actions are of consequence. Lessons of the wild teach us something about being human and what our relationship to nature is all about.

Refuge

Wilderness serves as a haven from the pressure of our fast-paced industrial society. It is a place where we can seek relief from the noise and speed of machines, confines of steel and concrete, and the crowding of people.

Educational Values

Wilderness is a teacher. Wilderness areas are living classrooms from which knowledge about ourselves and our world are lessons, waiting to be learned.

* * *

"In Wildness is the preservation of the world."
—Henry David Thoreau
"In human culture is the preservation of wildness."— Wendel Berry

WILDERNESS: A BRIEF HISTORY

Timeline for Management of Public Lands in the United States

1781	Lands west of Appalachians ceded by states to become "public domain"
1802	Louisiana Purchase - President Jefferson commissions Lewis and Clark to explore the Missouri drainage to the Pacific.
1820-30's	Peak of fur trade; beaver population declines dramatically.
1862	Under President Lincoln, the Homestead Act was passed, making 160 acres of public domain available to every family willing to work the land.
1865	Yosemite becomes the first reserve removed from the public domain, placed under jurisdiction of the State of California for protection as a park.
1872	Yellowstone becomes the first National Park.
1878	John Wesley Powell, in the "1878 Report on the Lands of the Arid Region of the United States", calls for more realistic systematic planning for the West and its resources, including the need for public water storage and resource conservation.
1891	The first Forest Reserve System was created.
1892	Sierra Club formed by John Muir and 26 San Francisco residents "to explore, enjoy, and render accessible the mountain regions of the Pacific Coast...and enlist the support and cooperation of the people and the government in preserving the forests and other natural features of the Sierra Nevada".
1896	Frederick Jackson Turner asserts, in The Significance of the American Frontier in American History that the frontier no longer exists. Also discusses the role of wilderness in fostering individualism, independence, and thus self-government.
1897	Congress passes the Forest Management Act, opening the forests to timber cutting, mining and grazing. This clarified the difference between preservation and conservation, a polarized view of public resources that still plagues land-use debates.

BACKGROUND

1905	Forest Reserves transferred from Department of Interior to the Department of Agriculture, thereby creating the Forest Service. A multiple-use policy was initiated under Gifford Pinchot, the first Forest Service Chief.
1916	National Park Service Organic Act was passed, creating the Park Service for the administration of the National Parks.
1919	Arthur Carhart, a Forest Service Landscape Architect, recommends that the Trappers Lake area in Colorado not be developed for summer homes, but allowed to remain wild. His plan is approved.
1924	Aldo Leopold, Forester and ecologist, persuades the Forest Service to protect the 574,000 acre Gila National Forest of New Mexico for wilderness recreation.
1926	W.B. Greeley, Chief Forester of the U.S. Forest Service, directs preparation of an inventory of all "de facto" wilderness in the national forests.
1929	The Forest Service issues the L-20 regulation to protect some of its "primitive" areas from commercial development until management plans are developed.
1930	Congress enacts the Shipstead-Newton-Nolan Act to protect over 1 million acres in the Superior Primitive Area in Minnesota--the first federal law in American history to protect a wilderness area.
1934	The Taylor Grazing Act is passed.
1935	The Wilderness Society is formed, led by Bob Marshall, Aldo Leopold and others.
1939	The Forest Service supplants the L-20 regulations with the "U Regulations". Former "primitive" are reclassified as "Wilderness," "wild" or "roadless," depending on size.
1946	Bureau of Land Management is created by the joining of the Grazing Service and General Land Office.
1950	Conservationists work to prevent construction of a dam at Echo Park in Dinosaur National Monument.
1955	Howard Zahniser, Executive Director of the Wilderness Society, writes first draft of a Wilderness Bill. This Bill would designate lands to be protected from any form of resource extraction.
1956	Senator Hubert Humphrey introduces the first Wilderness bill in the U.S.

	Senate. Congress preserves Echo Park by passing a bill that prevents any dam from being built in National Parks or Monuments.
1963	U.S. Senate passes the Wilderness Bill.
1964	House of Representatives passes the Wilderness Bill. President Johnson signs the Wilderness Act at a White House garden ceremony on September 3.
1976	Federal Land Policy and Management Act (FLPMA) passed repealing the Homestead Act and granting the Bureau of Land Management the authority it needed to fully manage its public lands.

. WILDERNESS .
AMERICA'S
ENDURING
RESOURCE

BACKGROUND

NATIONAL WILDERNESS PRESERVATION SYSTEM

Land Management Agencies

In 1964, Congress established the National Wilderness Preservation System, under the Wilderness Act. The legislation set aside certain federal lands as wilderness areas. These areas, generally 5,000 acres or larger, are wild lands largely in their natural state. The act says that they are areas "...where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." Four federal agencies of the United States government administer the National Wilderness Preservation System, which includes 603 areas, and more than 103 million acres.

National Park Service

The National Park Service was established to protect the nation's natural, historical, and cultural resources and to provide places for recreation. The Park Service manages 51 national parks. It also oversees more than 300 national monuments, historic sites, memorials, seashores, and battlefields.

Purpose: To provide for the use and enjoyment of the parks by people and to preserve the land in its original state.

Federal Department: Interior

Manages 13% of Federal Lands and 42% of the National Wilderness Preservation System.

U.S. Forest Service

The U.S. Forest Service manages national forests and grasslands. It conducts forestry research and works with forest managers on state and private lands. The Forest Service oversees close to 200 million acres of national forest and other lands.

Purpose: To provide for the wise use of our national forest resources. This multiple use concept includes recreation, wildlife, wilderness, timber, mining, grazing, oil and gas, hunting, and fishing.

Federal Department: Agriculture

Manages 30% Federal Lands and 33% of the National Wilderness Preservation System.

Bureau of Land Management

The Bureau of Land Management manages nearly 270 million acres. Among other activities, the Bureau conserves these lands and their historical and cultural resources for the public's use and enjoyment.

Purpose: Initially to manage range lands for use by mining, grazing, oil and gas development. Their role expanded to include recreation and wilderness after 1976.

Federal Department: Interior

Manages 42% of Federal Lands and 5% of the National Wilderness Preservation System.

U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service conserves the nation's wild animals and their habitats by managing a system of more than 500 national wildlife refuges and other areas, totaling more than 91 million acres of land and water.

Purpose: To conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of the American people. Administers the endangered Species Act.

Federal Department: Interior

Manages 15% of Federal Lands and 20% of the National Wilderness Preservation System.

NATIONAL WILDERNESS PRESERVATION SYSTEMS (NWPS) FACT SHEET

Agency	# of Units	NWPS Acres (%)
Forest Service, USDA	399	34,676,493 (33.5)
National Park Service, USDI	44	43,007,316 (41.5)
Fish and Wildlife Service, USDI	75	20,685,372 (20.0)
Bureau of Land Management, USDI	135	5,243,588 (5.0)
GRAND TOTAL	629*	103,612,769 (100)

National Wilderness Preservation System (excluding Alaska):

Agency	# of Units	NWPS Acres (%)
Forest Service, USDA	380	28,923,594 (62.6)
National Park Service, USDI	36	10,027,946 (21.7)
Fish and Wildlife Service, USDI	54	2,009,052 (4.3)
Bureau of Land Management, USDI	134	5,243,588 (11.3)
TOTAL	581	46,204,180 (100)

National Wilderness Preservation System (Alaska)

Agency	# of Units	NWPS Acres (%)
Forest Service, USDA	19	5,752,899 (10.0)
National Park Service, USDI	8	32,979,370 (57.4)
Fish and Wildlife Service, USDI	21	18,676,320 (32.5)
TOTAL	48	57,408,589 (100)

NOTE: Detailed breakdowns by wilderness within each State and Agency jurisdiction can be found in the Annual Wilderness Report to Congress. Some acreage values are estimates, pending final mapping and surveys. Changes in acreage are not uncommon. For the most up-to-date statistics, contact one of the federal land managing agencies.
*Total number of units for all agencies is 630; this is not additive from information above because of overlapping responsibilities. Date parepared: 10/30/96.

LAWS AFFECTING WILDERNESS MANAGEMENT

Hundreds of laws and thousands of administrative policies affect wilderness management today. Below are a few of the most important acts of Congress relating to management of the National Wilderness Preservation System.

General Mining Act of 1872

Enacted to promote the development of mining resources in the United States. This act declared the public lands free and open to mineral exploration and purchase, and all lands with valuable mineral deposits open for occupancy. This act established the procedure for mining claims and operations. Though it is 100 years old, this act still influences management in some wilderness areas with mineral resources.

Organic Act of 1897

Established the procedure to set aside federal forest reserves, which later became National Forests. The bill was enacted to secure favorable conditions of water flows, and to produce a continuous supply of timber to meet the needs of U.S. citizens.

1960 Multiple Use Sustained Yield Act

Following World War II, the demand for forest products increased dramatically. Pressure for various uses of National Forest land led Congress to pass MUSY. Congress defined 5 administrative responsibilities for the U.S. Forest Service: recreation, timber, grazing, watershed, wildlife habitat. "Multiple Use" meant that forests, in general, cannot be used exclusively for one purpose but certain areas within a forest can be.

1964 Wilderness Act

This Act initially protected 54 wilderness areas (9.1 million acres) by withdrawing them from standard multiple use management and established a process for adding new lands to the system. Lands classified Wilderness through the Wilderness Act can be under jurisdiction of the U.S. Forest Service, National Park Service, or U.S. Fish and Wildlife Service. With some exceptions, prohibitions include closure to motorized and mechanized vehicles, timber harvest, new grazing and mining activity, or any kind of development. Currently there are 630 areas in the National Wilderness Preservation System totalling approximately 104 million acres.

1968 Wild and Scenic Rivers Act

Established a national system of rivers to be preserved in free-flowing condition, with their immediate environments protected. Congress selected certain rivers that possess outstandingly remarkable outdoor values. They established an initial system of eight rivers, and set up methods and procedures for adding new rivers to the system. There are three classifications of rivers in the system: wild, scenic, or recreational depending on the level of development near the stretch of river.

1969 National Environmental Policy Act

One prominent provision of this act directs all federal agencies to prepare Environmental Impact Statements before development on public lands. Requires public involvement on land management plans and issues. Enacted to declare a national policy, encouraging productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment, and stimulate the health and welfare of man. Also to enrich our understanding of ecological systems and natural resources, this Act established the Council on Environmental Quality.

Endangered Species Acts of 1973, 1978, 1982

Enacted to provide a program for the conservation of wildlife and plant species that are threatened or endangered with extinction. The Act recognizes that several species of plants are in danger of extinction, and these species are of aesthetic, ecological, educational, historical, recreational and scientific value. The act sets up specific procedures to determine which plant and animal species are added or removed from protective status. It also sets up cooperative programs with states and civil penalties for violation of the act. Subsequent amendments to this act were made in 1978 and 1982.

1975 “Eastern” Wilderness Act

Added several areas in the Eastern United States (east of the 100th meridian) to the National Wilderness Preservation System. Although many of these Eastern areas are smaller than those in the West, and have had more historic human influences, they are to be managed in a consistent manner with all wilderness areas. Unlike the Wilderness Act, this legislation allowed the power to condemn private lands in these areas and authorized funding to purchase private lands.

1976 National Forest Management Act

The result of a suit filed against the U.S. Forest Service for its clearcutting practices in West Virginia. Congress required the USFS to harvest timber on a sustained yield basis and set guidelines for clearcutting. It also directed the USFS to address details on land use planning through ten year Forest Plans.

1976 Forest Land Policy and Management Act (FLPMA)

Section 603 of FLPMA authorized the BLM to classify and recommend suitable BLM lands for wilderness designation.

1980 Alaska National Interest Lands Conservation Act

This act provided for designation and conservation of certain public lands in Alaska. The bill added about 56 million acres to the National Wilderness Preservation System in 35 areas administered by the National Park Service, U.S. Fish and Wildlife Service, and U.S. Forest Service. Several Wild and Scenic Rivers were also added to the national system. It was the intent of Congress to preserve unrivaled scenic and geological values associated with natural landscapes, and to preserve vast unaltered arctic tundra, boreal forest, and coastal rain forest ecosystems. Another major purpose was to protect wildlife habitat for species dependent on large undeveloped areas.

Individual Wilderness Bills (1978, 1980, 1982, 1983, 1984)

Since 1964, Congress has passed 64 laws adding 428 areas and over 87 million acres to the National Wilderness Preservation System. From 1965 through 1983 legislation focused on individual areas and occasionally packaged several areas in one bill. More recently Congress has acted on legislation packaging several areas in a state together in one bill. In 1985 there were almost 89 million acres in the National Wilderness Preservation System. Over 60% (56 million) of these acres are in Alaska. Idaho, Montana, and Utah have bills that are still being debated.

LAND CLASSIFICATIONS RELATED TO WILDERNESS

There are many land classifications for public lands that compliment the Wilderness system. Many of these classifications better fit the recreation needs of diverse users and are excellent alternatives to visiting a Wilderness. Provided below are some other major classifications.

National Forest Roadless Areas

Millions of acres of wild, undeveloped land without roads exist on National Forest land outside of classified Wilderness. They offer similar opportunities for wilderness recreation, and in many cases they also provide opportunities for some forms of motorized recreation such as riding trail bikes. Check with local ranger district offices to obtain maps and learn more about these areas. They offer excellent alternatives for primitive recreation.

National Trails System

A National Trail System was established by Congress in 1968 including three types of trails: (1) National Recreation Trails providing a wide variety of recreation uses near urban areas; (2) National Scenic Trails such as the Appalachian Trail, the Lewis and Clark Trail and the Pacific Crest Trail; and (3) side trails to connect recreation and scenic trails, and provide better access to them. Some of these national trails are in Wilderness areas and many are on other public lands.

National Wild and Scenic Rivers

In 1968 Congress established a national system of rivers to be preserved in free-flowing condition, with their immediate environments protected. Congress selected certain rivers that possess outstandingly remarkable outdoor values. There are now 61 rivers or river segments in the system. There are three classifications of rivers in the system: wild, scenic, or recreational depending on the level of development near the stretch of river. A few states have passed legislation establishing wild and scenic rivers that are managed under state jurisdiction.

National Recreation Areas

In 1972, Congress designated the Sawtooth National Recreation Area, the nation's first area of this kind. Since that time several National Recreation Areas have been designated around the country. Unlike Wilderness areas, there is no one law guiding management of these areas; each one is unique. Also unlike Wilderness, motorized equipment and other management actions are allowed, although the primary management objectives of these areas is for recreation.

Research Natural Areas

A system of Research Natural Areas exist through out the country on public lands. Unlike wilderness areas, recreation is not a primary use in these areas, but they supplement the educational and scientific values of Wilderness areas. These areas are intended to serve as gene pools for rare and endangered species and as examples of significant natural ecosystems. Like Wilderness areas, they also serve as important outdoor laboratories to study natural systems.

State and Private Wilderness

Although most Wilderness exists on federal lands, there are some examples of wilderness management under other ownership. As early as 1885, the state of New York set aside a large area in the Adirondacks to remain forever wild, and protect a valuable water source. Other states have also established state wilderness systems.

Biosphere Reserve Program

The United Nations Educational, Scientific and Cultural Organization established the Biosphere Reserve Program in 1973 to protect examples of major natural regions throughout the world, and provide opportunities for ecological research and education.

Wilderness - Related Career Options

Use this list of Wilderness-related careers to explore potential careers. Ideas may include interviewing professionals, conducting research to learn more about the career, or arranging mentorships.

nature writer
interpretation specialist
environmental educator
artist
playwright
photographer
photo journalist
historian
policy maker
natural resource professional
public land manager
outdoor recreation planner
forester
county extension agent
fire fighter
Wilderness manager
research scientist
Wilderness ranger
Wilderness advocate
religious or spiritual leader
laborer
landscape architect
philosopher
miner
outdoor retailer
anthropologist
archaeologist
naturalist
restorationist
ecologist
conservation biologist
wildlife biologist
botanist
soil scientist
geologist
cartographer
air quality regulator
hydrologist
meteorologist
computer scientist
land planner
engineer
range scientist
geneticist
outdoor trip leader
mediator
musician
trail crew worker
population analyst
farmer or rancher
commercial outfitter
lawyer
ethnologist
storyteller

WILDERNESS ACT

Act of September 3, 1964,
(P.L 88-577, 78 Stat. 890; 16 U.S.C. 1 1 21 (note), 1 1 31-1136)

To establish a National Wilderness Preservation System for the permanent good of the whole people, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Short Title

Wilderness Act

Sec 1. This Act may be cited as the "Wilderness Act" (I 6 U.S.C. 1 1 21 (note))

WILDERNESS SYSTEM ESTABLISHED STATEMENT OF POLICY

Sec. 2. (a) In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify, all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act.

(b) The inclusion of an area in the National Wilderness Preservation System notwithstanding, the area shall continue to be managed by the Department and agency having jurisdiction thereover immediately before its inclusion in the National Wilderness Preservation System unless otherwise provided by Act of Congress. No appropriation shall be available for the payment of expenses or salaries for the administration of the National Wilderness Preservation System as a separate unit nor shall any appropriations be available for additional personnel stated as being required solely for the purpose of managing or administering areas solely because they are included within the National Wilderness Preservation System.

78 STAT. 890.
78 STAT. 891.

DEFINITION OF WILDERNESS

(c) A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has a least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological or other features of scientific, educational, scenic, or historical value. (16 U.S.C. 1131)

NATIONAL WILDERNESS PRESERVATION SYSTEM—EXTENT OF SYSTEM

Sec. 3. (a) All areas within the national forests classified at least 30 days before the effective date of the Act by the Secretary of Agriculture or the Chief of the Forest Service as 'wilderness', 'wild' or "canoe" are hereby designated as wilderness areas. The Secretary of Agriculture shall--

(1) Within one year after the effective date of this Act, file a map and legal description of each wilderness area with the Interior and Insular Affairs Committees of the United States Senate and House of Representatives, and such descriptions shall have the same force and effect as if included in this Act: Provided however, That correction of clerical and typographical errors in such legal descriptions and maps may be made.

(2) Maintain, available to the public, records pertaining to said wilderness areas, including maps and legal descriptions, copies of regulations governing them, copies of public notices of, and reports submitted to Congress regarding pending additions, eliminations, or modifications. Maps, legal descriptions, and regulations pertaining to wilderness areas within their respective jurisdictions also shall be available to the public in the offices of regional foresters, national forest supervisors, and forest rangers.

Classification

Presidential recommendation to Congress.

Congressional approval.

78 STAT. 891.
78 STAT. 892.

(b) The Secretary of Agriculture shall, within ten years after the enactment of this Act, review, as to its suitability or nonsuitability for preservation as wilderness, each area in the national forests classified on the effective date of this Act by the Secretary of Agriculture or the Chief of the Forest Service as "primitive" and report his finding to the President. The President shall advise the United States Senate and House of Representatives of his recommendations with respect to the designation as "wilderness" or other reclassification of each area on which review has been completed, together with maps and a definition of boundaries. Such advice shall be given with respect to not less than one-third of all the areas now classified as "primitive" within three years after the enactment of this Act, not less than two-thirds within seven years after the enactment of this Act, and the remaining areas within ten years after the enactment of this Act. Each recommendation of the President for designation as "wilderness" shall become effective only if so provided by an Act of Congress. Areas classified as "primitive" on the effective date of this Act shall continue to be administered under the rules and regulations affecting such areas on the effective date of this Act until Congress has determined otherwise. Any such area may be increased in size by the President at the time he submits his recommendations the Congress by not more than five thousand acres with no more than one thousand two hundred and eighty acres of such increase in any one compact unit; if it proposed to increase the size of any area by more than five thousand acres or by more than one thousand two hundred and eighty acres in any one compact unit the increase in size shall not become effective until acted upon by Congress. Nothing herein contained shall limit the President in proposing, as part of his recommendations to Congress, the alteration of existing boundaries of primitive areas or recommending the addition of any contiguous area of national forest lands predominately of wilderness value. Notwithstanding any other provisions of this Act, the Secretary of Agriculture may complete his review and delete such area as may be necessary, but not to exceed seven thousand acres, from the southern tip of the Gore Range-Eagles Nest Primitive Area, Colorado, if the Secretary determines that such action is in the public interest.

Report to the President.

Presidential recommendation to Congress.

Congressional approval.

(c) Within ten years after the effective date of this Act the Secretary of the Interior shall review every roadless area of five thousand contiguous acres or more in the national parks, monuments and other units of the national park system and every such area of, and every roadless island within, the national wildlife refuges and game ranges, under his jurisdiction on the effective date of this Act and shall report to the President his recommendation as to the suitability or nonsuitability of each such area or island for preservation as wilderness. The President shall advise the President of the Senate and the Speaker of the House of Representatives of his recommendation with respect to the designation as wilderness of each such area or island on which review has been completed, together with a map thereof and a definition of its boundaries. Such advice shall be given with respect to not less than one-third of the areas and islands to be reviewed under this subsection within three years after enactment of this Act, not less than two-thirds within seven years of enactment of this Act, and the remainder within ten years of enactment of this Act. A recommendation of the President for designation as wilderness shall become effective only if so provided by an Act of Congress. Nothing contained herein shall, by implication or otherwise, be construed to lessen the present statutory authority of the Secretary of the Interior with respect to the maintenance of roadless areas within the national park system.

Suitability.

(d) **(1)** The Secretary of Agriculture and the Secretary of the Interior shall, prior to submitting any recommendations to the President with respect to the suitability of any area for preservation as wilderness--

Publication in Federal Register.

(A) give such public notice of the proposed action as they deem appropriate, including publication in the Federal Register and in a newspaper having general circulation in the area or areas in the vicinity of the affected land;

Hearings.

Publication in Federal Register.

(B) hold a public hearing or hearings at a location or locations convenient to the areas affected. The hearings shall be announced through such means as the respective Secretaries involved deem appropriate, including notices in the Federal Register and in newspapers of general circulation in the area: Provided, That if the lands involved are located in more than one State, at least one hearing shall be held in each State in which a portion of the land lies;

78 STAT. 892.
78 STAT. 893.

(C) at least thirty days before the date of a hearing advise the Governor of the State and the governing board of each county, or in Alaska the borough, in which the lands are located, and Federal departments and agencies concerned, and invite such officials and Federal agencies to submit their views on the proposed action at the hearing or by no later than thirty days following the date of the hearing.

(2) Any views submitted to the appropriate Secretary under the provisions of (1) of this subsection with respect to any area shall be included with any recommendations to the President and to Congress with respect to such area.

Proposed modificaton.

(e) Any modification of adjustment of boundaries of any wilderness area shall be recommended by the appropriate Secretary after public notice of such proposal and public hearing or hearings as provided by in subsection (d) of this section. The proposed modification or adjustment shall then be recommended with map and description thereof to the President. The President shall advise the United States Senate and the House of Representatives of his recommendations with respect to such

modification or adjustment and such recommendation shall become effective only in the same manner as provided for in subsections (b) and (c) of this section. (16 U.S.C. 1132)

USE OF WILDERNESS AREAS

Sec. 4. (a) The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and national wildlife refuge systems are established and administered and--

16 USC 475.
16 USC 528-531

(1) Nothing in this Act shall be deemed to be in interference with the purpose for which national forests are established as set forth in the Act of June 4, 1897 (30 Stat. 1 1), and the Multiple-Use Sustained-Yield Act of June 12, 1960 (74 Stat. 215).

16 USC 577-577b
16 USC 577c-577h
16USC 577d-l, 577g-l, 577h

(2) Nothing in this Act shall modify the restrictions and provisions of the Shipstead-Nolan Act (Public Law 539, Seventy-first Congress, July 10, 1930; 46 Stat. 1020), the Thye-Blatnick Act (Public Law 733, Eightieth Congress, June 22, 1948; 62 Stat. 568), and the Humphrey-Thye-Blatnik-Andresen Act (Public Law 607, Eighty-fourth congress, June 22, 1956; 70 Stat. 326), as applying to the Superior National Forest or the regulations of the Secretary of Agriculture.

39 STAT. 535.
16USC 1 et seq

41 STAT. 1063.
49 STAT. 838.

(3) Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with the Act of August 25, 1916, the statutory authority under which the area was created, or any other Act of Congress which might pertain to or affect such area, including, but not limited to, the Act of June 8, 1906 (34 Stat. 225; 16 U.S.C. 432 et seq.); section 3(2) of the Federal Power Act (16 U.S.C. 796(2)); and the Act of August 21, 1935 (49 Stat. 666; 16 U.S.C. 461 et seq.).

78 STAT. 893.
78 STAT. 894.

(b) Except as otherwise provided in this Act, each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

PROHIBITION OF CERTAIN USES

(c) Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

SPECIAL PROVISIONS

(d) The following special provisions are hereby made:

(1) Within wilderness areas designated by this Act the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restriction as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.

(2) Nothing in this Act shall prevent within national forest wilderness areas any activity, including prospecting, for the purpose of gathering information about mineral or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment. Furthermore, in accordance with such program as the Secretary of the Interior shall develop and conduct in consultation with the Secretary of Agriculture, such areas shall be surveyed on a planned, recurring basis consistent with the concept of wilderness preservation by the Geological Survey and the Bureau of Mines to determine the mineral values, if any, that may be present; and the results of such surveys shall be made available to the public and submitted to the President and Congress.

Mineral leases, claims, etc.

(3) Notwithstanding any other provisions of this Act, until midnight December 31, 1983, the United States mining laws and all laws pertaining to mineral leasing shall, to the same extent as applicable prior to the effective date of this Act, extend to those national forest lands designated by this Act as "wilderness areas"; subject, however, to such reasonable regulations governing ingress and egress as may be prescribed by the Secretary of Agriculture consistent with the use of the land for mineral location and development and exploration, drilling, and production, and use of land for transmission lines, waterlines, telephone lines, or facilities necessary in exploring, drilling, producing, mining, and processing operations, including where essential the use of mechanized ground or air equipment and restoration as near as practicable of the surface of the land disturbed in performing prospecting, location, and in oil and gas leasing, discovery work, exploration, drilling, and production, as soon as they have served their purpose. Mining locations lying within the boundaries of said wilderness areas shall be held and used solely for mining or processing operations and uses reasonably incident thereto; and hereafter, subject to valid existing rights, all patents issued under the mining laws of the United States affecting national forest lands designated by this Act as wilderness areas shall convey title to the mineral deposits within the claim, together with the right to cut and use so much

78 STAT. 894.
78 STAT. 895.

of the mature timber therefrom as may be needed in the extraction, removal, and beneficiation of the mineral deposits, if needed timber is not otherwise reasonably available, and if the timber is cut under sound principles of forest management as defined by the national forest rules and regulations, but each such patent shall reserve to the United States all title in or to the surface of the lands and products there of, and no use of the surface of the claim or the resources therefrom not reasonably required for carrying on mining or prospecting shall be allowed except as otherwise expressly provided in the Act: *Provided*, That unless hereafter specifically authorized, no patent within wilderness areas designated by this Act shall issue after December 31, 1983, except for the valid claims existing on or before December 31, 1983. Mining claims located after the effective date of this Act within the boundaries of wilderness areas designated by this Act shall create no rights in excess of those rights which may be patented under the provisions of this subsection. Mineral leases, permits, and licenses covering lands within national forest wilderness areas designated by this Act shall contain such reasonable stipulations as may be prescribed by the Secretary of Agriculture for the protection of the wilderness character of the land consistent with the use of the land for the purposes for which they are leased, permitted, or licensed. Subject to valid rights then existing, effective January 1, 1984, the minerals in lands designated by this Act as wilderness areas are withdrawn from all forms of appropriation under the mining laws and from disposition under all laws pertaining to mineral leasing and all amendments thereto.

Water resources.

(4) Within wilderness areas in the national forests designated by this Act, (1) the President may, within a specific area and in accordance with such regulations as he may deem desirable, authorize prospecting for water resources, the establishment and maintenance of reservoirs, water-conservation works, power projects, transmission lines, and other facilities needed in the public interest, including the road construction and maintenance essential to development and use thereof, upon his determination that such use or uses in the specific area will better serve the interests of the United States and the people thereof than will its denial; and (2) the grazing of livestock, where established prior to the effective date of this Act, shall be permitted to continue subject to such reasonable regulations as are deemed necessary by the Secretary of Agriculture.

(5) Other provisions of this Act to the contrary notwithstanding, the management of the Boundary Waters Canoe Area, formerly designated as the Superior, Little Indian Sioux and Caribou Roadless Areas, in the Superior National Forest, Minnesota, shall be in accordance with regulations established by the Secretary of Agriculture in accordance with the general purpose of maintaining, without unnecessary restrictions on other uses, including that of timber, the primitive character of the area, particularly in the vicinity of the lakes, streams, and portages: Provided, That nothing in this Act shall preclude the continuance within the area of any already established use of motorboats.

(6) Commercial services may be performed within the wilderness areas designated by this Act to the extent necessary for activities which are proper for realizing the recreational or other wilderness purposes of the areas.

(7) Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.

(8) Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests (16 U.S.C. 1133)

789 STAT. 895.
78 STAT. 896.

STATE AND PRIVATE LANDS WITHIN WILDERNESS AREAS

Sec. 5. **(a)** In any case where State-owned or privately owned land is completely surrounded by national forest lands with areas designated by this Act as wilderness, such State or private owner shall be given such rights as may be necessary to assure adequate access to such State-owned or privately owned land by such State or private owner and their successors in interest, or the State-owned land or privately owned land shall be exchanged for federally owned land in the same State of approximately equal value under authorities available to the Secretary of Agriculture: Provided, however, That the United States shall not transfer to a State or private owner any mineral interests unless the State or private owner relinquishes or causes to be relinquished to the United States the mineral interest in the surrounded land.

Transfers, restriction.

(b) In any case where valid mining claims or other valid occupancies are wholly within a designated national forest wilderness area, the Secretary of Agriculture shall, by reasonable regulations consistent with the preservation of the area of wilderness, permit ingress and egress to such surrounded areas by means which have been or are being customarily enjoyed with respect to other such areas similarly situated.

78 STAT. 896.

(c) Subject to the appropriation of funds by Congress, the Secretary of Agriculture is authorized to acquire privately owned land within the perimeter of any area designated by this Act as wilderness if (1) the owner concurs in such acquisition or (2) the acquisition is specifically authorized by Congress (16 U.S.C. 1134)

Acquisition.

GIFTS, BEQUESTS, AND CONTRIBUTIONS

Sec. 6. **(a)** The Secretary of Agriculture may accept gifts or bequests of land within wilderness areas designated by this Act for preservation as wilderness. The Secretary of Agriculture may also accept gifts or bequests of land adjacent to wilderness areas designated by this Act for preservation as wilderness if he has given sixty days advance notice thereof to the President of the Senate and the Speaker of the House of Representatives. Land accepted by the Secretary of Agriculture under this section shall become part of the wilderness area involved. Regulations with regard to any such land may be in accordance with such agreements, consistent with the policy of this Act, as are made at the time of such gift, or such conditions, consistent with such policy, as may be included in, and accepted with, such bequest.

(b) The Secretary of Agriculture or the Secretary of the Interior is authorized to accept private contributions and gifts to be used to further the purposes of this Act. (16 U.S.C. 1135)

ANNUAL REPORTS

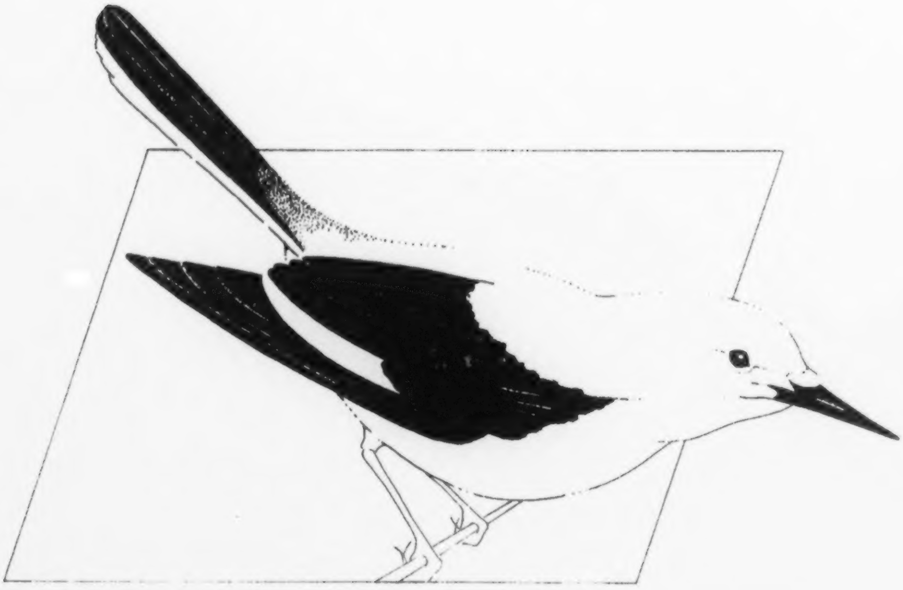
Sec. 7. At the opening of each session of Congress, the Secretaries of Agriculture and Interior shall jointly report to the President for transmission to Congress on the status of the wilderness system, including a list and descriptions of the areas in the system, regulations in effect, and other pertinent information, together with any recommendations they may care to make. (16 U.S.C. 11 36)

APPROVED SEPTEMBER 3, 1964.

Legislative History:

House Reports: No 1538 accompanying H.R. 9070 (Committee on Interior & Insular
Affairs) and No. 1829 (Committee of Conference).
Senate report: No. 109 (Committee on Interior & Insular Affairs). Congressional Record:
Vol. 109 (1963): April 4, 8, considered in Senate.
April 9, considered and passed Senate.
Vol. 110 (1964): July 28, considered in House.
July 30, considered and passed House, amended, in lieu of H.R. 9070
August 20, House and Senate agreed to conference report.

PRIMARY LESSONS
for Grades K-2



Primary

STRAND	OVERVIEW	AESTHETICS
GOAL	**To gain a general understanding of wilderness as a place predominantly influenced by the forces of nature.**	**To appreciate sensory awareness as a means of enjoying and learning about wild nature.**
OBJECTIVE(S)	Students will be able to identify similarities and differences between their home and wild environments. Students will demonstrate an awareness of wilderness as a place; not developed by or for humans.	Each student will describe one or more items they might see, smell, touch, or hear in the wild outdoors.
LESSON Activities	Lesson: Introduction to Wilderness (Page 47) Activity 1: Magic School Bus to the End of the Sidewalk Activity 2: Wilderness Collage Activity 3: Wildbook Introduction	Lesson: Wild Wise (Page 51) Activity 1: Feely Bag Activity 2: What the Nose Knows Activity 3: The Other Way to Listen Activity 4: Sensory Search

Primary

STRAND	PERSPECTIVES	ECOLOGY
GOAL	**To understand that even the places where we now live were once wild.**	**To understand connections between wildlife and their wild habitats.**
OBJECTIVE(S)	Students will identify features that have probably remained unchanged from a time when the area was once wild. Students will understand the history of westward expansion in America, how the landscape has changed and what steps have been taken to preserve the last vestiges of wilderness.	Lesson 1 - Students will be able to describe three basic needs of all animals. Students will define differences and similarities between wild and tame animals. Students will state in their own words why wild animals need wild places to live. Lesson 2 - Students will use the examples of a beaver to describe two ways in which they are adapted for life in a wilderness habitat. Students will be able to identify 10 wild animals in their state Students will describe why wilderness is a critical habitat for wild animals. Lesson 3 - Students will increase their knowledge of the habitats adaptations, and life histories of two animals frequently associated with wilderness.
LESSON Activities	Lesson: Once Wild (Page 57) Activity 1: Wilderness: A Flannel Board Story Activity 2: A River Ran Wild Activity 2: Shape Art of the Past	Lesson 1: What is Wild? (Page 61) Activity 1: Basic Needs Activity 2: Wild or Not? Lesson 2: Habitadaptations (Page 65_ Activity 1: Beaver Adaptations Activity 2: Wildlife: Who's Who? Activity 3: I Spy: Wildlife Search Lesson 3: Creative Movement for Wilderness Species (Page 73) Activity 1: The Life & Times of the Bald Eagle Activity 2: Grizzly Bear Habits & Habitats

Primary

STRAND	CONNECTIONS	SKILLS
GOAL	**To understand the effects human actions can have on wild environments.**	**To understand that special materials and skills are necessary for safe and ethical recreation in wild lands.**
OBJECTIVE(S)	Students will describe two ways that human pollution and litter are harmful to the environment. Students will describe two ways that human actions can help sustain the natural features of their community or wild places. Students will create at least one rule or policy to help protect wild places.	Students will describe five essential items to take with them on a day hike and what to do if they become separated from an adult in a wild place.
LESSON Activities	Lesson 1: Wilderness Impacts (Page 79) Activity 1: No Place for Litter Activity 2: Lessons from Woodsy the Owl Activity 3: Woodsy and Wilderness Activity 4: Wilderness Writing	Lesson 1: Wilderness Skills (Page 83) Activity 1: To Bring or Not To Bring Activity 2: Don't Forget Activity 3: Group Gorp Activity 4: Pack Your Pack

OVERVIEW

Lesson 1: Introduction to Wilderness

Objectives:

- Students will identify similarities and differences between their home and wild environments.
- Students will demonstrate awareness of wilderness as a place not developed by or for humans.

Background:

Many children have never visited wilderness, though they may have images from stories or movies of what such places would be like. Drawing on students' own experiences and perceptions, these activities introduce the concept of wilderness by comparing wild places to developed places. The levels of distinction students make will vary with their experience, age, and the location of your community. A good definition of wilderness for this age group for your own reference is that of a place influenced by the forces of nature, where people visit, but do not live.

Progression:

Activity 1 introduces students to wildlands through a guided imagery activity. In Activity 2 students gather images of wild places from magazines and other resources to create their own impression of wilderness. Activity 3 introduces students to the Wilderness Wildbook, *an interactive workbook, whose pages correspond with lessons within each of the strands of this (primary) section.* Wildbook *masters can be found on Pages 89 through 96 at the end of this section.*

See Also:

- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Introduction to Wilderness—(Middle-Overview), Page 209
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity 1: Magic School Bus to the End of the Sidewalk

Materials:	3 large writing papers
Procedure:	1) Based on your readings of the background, share with students your own definition of "wildlands" or a "wild place". You might also ask them to share their perceptions of these words with you. 2) Tell students you are going to take an imaginary trip to a place that is wild. Create your own story or use the following scenario to stimulate students thinking. Students could quietly act out the story you describe. You may even wish to arrange chairs as the seats of a school bus and have students "climb aboard."

"Imagine we are all going to pack up backpacks with water, food and other things we will need to be outside all day. We are going to travel in our magic school bus...everyone aboard and take a seat! We'll drive through town, past neighborhoods until we can't see highways, stores, or gas stations. We are driving a long time. It is such a long way, that everyone goes to sleep! The bus keeps moving until finally it stops at the edge of a wild place. You can hear a few quiet sounds of birds singing and the water in a creek nearby. It smells clean and suddenly you can feel grass under your feet. The school bus has disappeared, but it will be back soon. Before you open your eyes, make a picture in your mind of what you might see in this wild place."

2) On one paper labeled "Wild" write down images as students share them. A helpful hint: remind students that in this place there is nothing that is 'man made', aside from what is on or with them. Encourage students to be specific in their descriptions. Also have available a paper labeled "Wild" and "Developed" on which to record this category. For example, people belong in both places, but many of their actions are different in response to their surroundings. Plants and animals live in both places, though species may differ and even the same species may use different behaviors.

3) Finish off by getting back in the school bus and coming back to your classroom. On the other piece of paper labeled "City", "Town", or "Developed", write down all the things you see as you come into a developed area from your imaginary journey. Save these papers for Activity 2.

4) Compare the two. What are the similarities? differences?

Activity 2: Wilderness Collage

Materials: Scissors, glue, paper

Magazines (to cut up)

Procedure: 1) Review the words generated in Activity 1.

2) As a large group, small groups, or in pairs, use the magazines to cut out pictures and make collages of things that might be found in wild places on one page and those found in cities or towns. And if you wish, also a category for both. *Note that people may be in both collages. With older students you may wish to have them create collages, or make illustrations around the words "Wilderness" and "City".*

3) Have students share their work with the group.

Activity 3: Wildbook Introduction

Materials: Wilderness wolf collage poster

Wilderness Wildbook cover & page one found at the end of the primary section.

Procedure: *The wolf collage poster provides opportunities to discuss many cultural, historical, ecological and recreational aspects of wilderness as appropriate to the interests and age of your group. The wolf was chosen for this poster because wolves need large, wild places to live.*

1. Introduce the word 'wilderness' and the poster. Explain that everything inside the wolf could be found in a wilderness. Also refer to the students own collages.

2. Questions for discussion:

1) What animals are in the poster? Would you see them in a city?

2) What are people doing? Can you find people of different ages? Is there anyone your age? Can you find people that look like they lived a long time ago?

3) Are there different kinds of wild places? Can you find mountains? Deserts? Lakes?

4) What would you like to do or where would you like to go to visit a Wilderness? Many Wilderness areas are mountainous. Discuss some of the other ecosystems.

5) Introduce the *Wildbook* as a book students will be creating during your study of wilderness. Distribute copies of the entire *Wildbook*, or at least the cover and first page. Book master is at the end of the primary section.

6) Point out the wolf collage on the cover. Read the text and have students complete page 1. Find at end of overview lessons.

Extensions:

- Enjoy "Come Walk With Me" on **Kid for the Wild"** tape.
- See the elementary overview lesson "Wild Words", an activity that may easily be adapted for your students.
- Cut out collages in large shapes of things from wild or city places, and decorate your room.

EVALUATION:

* Have each student share ways their home is different and similar to a wild place.

There is a place
where the sidewalk ends and before the
street begins, and there the grass grows soft
and white, and there the sun burns crimson
bright...past the pits where the asphalt
flowers grow we shall walk with a walk
that is measured and slow,
...to the place where
the sidewalk ends.

—Shel Silverstein

AESTHETICS

Lesson 1: Wild Wise

Objective:

- Each student will describe one or more items they might see, smell, touch, or hear in the wild outdoors.

Background:

Though wild places are often depicted through beautiful photographs and artwork, it is important to note that when we are outdoors our impressions are formed through a combination of all our senses. Making students aware of their senses and encouraging them to use them will increase their understanding and connection with the outdoors. Thus, a general introduction to the five senses is appropriate for the lesson. Senses might be compared to 'tools' for learning about the natural world, that students carry with them all the time. To emphasize this point you could even bring in a tool box filled with cut outs of a hand, ear, eye, nose, and mouth to represent these senses as you discuss how each of them may be used in learning about the outdoors.

Activity 1 addresses the sense of touch, followed by Activity 2 dealing with smell. Activity 3 encourages students to listen carefully to the world around them, and Activity 4 is a compilation of several senses.

This lesson addresses all senses except taste, due to poisons, allergies, etc. This is not meant to discourage discussions of wild edibles, emphasizing that children should ***never*** *eat anything in the wild.*

See Also:

- Sensory Awareness in Wild Nature—(Elementary-Aesthetics), Page 109

Activity 1: Feely Bag

Materials:

- **Wild bag & contents**
- Additional small objects from nature (rocks, bones, sticks, feather, shell, etc.)

Procedure:

1) Introduce this activity by asking how is it possible to "see" with your hands?

2) Demonstrate the use of the bag by reaching into it and feeling the contents without looking or taking them out.

3) Tell students that none of the objects are alive or harmful, but some may be fragile and all objects should be handled with care. Explain that these items have been removed from nature to help students learn about them and their senses of touch. Items were not taken from Wilderness, because we are to take only photographs and leave only footprints.

4) Select one or two objects from the bag at a time to pass around in the bag. Instruct students to keep their ideas quiet until everyone has had a chance to be surprised by what is in the bag.

5) After the bag has been passed around the group, discuss what the students learned about the objects by feeling them.

6) Compare or list the different words used to describe the objects, and the information gained by touching them.

7) Examine all the objects and discuss their roles in a natural environment. How can these items be used by people in ways that do not interfere with their other purposes? (You might discuss options of taking pictures or drawing illustrations of interesting things you find then returning them to their home.)

Extension:

- Have students make up a story using the list of words describing the contents of the feely bag or expand the objects and descriptions into an art project or language activity.

Activity 2: What the Nose Knows

Materials: Cotton Balls

Small paper cups or film canisters

Scent makers (anything that will create a scent; soaps, flavorings, perfume, crushed pine needles, damp dirt, citrus peel, flowers)

Procedure: 1) *Prepare small containers with materials that will produce a scent. Liquids can be soaked in cotton balls and other items slightly crushed.*

2) *Begin the activity by explaining a bit about how mammals smell.* Tell students that inside a mammals nose is an area called the olfactory region that is a collection of smelling nerves; which if possible, try to dramatize this or use the skulls in the box to show where the nostrils and nerves are located. When mammals breathe, odors in the air reach these nerves, which pass on this information to the brain. To varying degrees, most mammals can distinguish several hundred different smells. By detecting pheromones, special chemicals given off by animals of the same species, animals are able to find other members of their family as well as potential mates. The sense of smell is used to locate food and detect predators.

3) There are several ways to use the scent containers:

- Have two containers of each scent. Distribute the containers to each student. Tell them to locate a partner with the same scent (pheromones) or have students find the scent container placed around the room, that contains their same scent.
- Pass around scent containers in a similar format to that of Activity 1, identifying different smells.

4) What did you learn/observe about these scents? Discuss times when humans might use their sense of smell in the outdoors. You might include in your conversation detecting wild fires, the sulfur smell of hot springs, skunks, how the ocean smells different than mountains, and enjoyable things to smell in nature.

Extension:

- There are excellent scenes in **"The Last Parable"** video of a bear smelling.

Activity 3: The Other Way to Listen

Materials:

The Other Way To Listen by Byrd Baylor

"You Don't Need Ears To Listen" from ***A Kid for the Wild***

Sharing Nature with Children

Procedure:

Introduction: Ask students to imagine what it would be like to have a hearing disability. Could you "hear" in other ways? Why might it be important for other mammals to use their sense of hearing? How might this increase human enjoyment of the outdoors? What can you hear outdoors that teaches you something about where you are? Consider bird sounds, thunder, water flowing, and animals moving.

1) Conduct a 5-15 minute quiet time. You can do this activity inside your classroom, on the school ground or a loud place near school. Students will note all the sounds they hear. Emphasize the importance of being very quiet, so you can hear more. Share and record student responses. Select the quietest area of your school ground. As a group or individually, select a listening place to sit quietly for 5-15 minutes. Share and record the sounds students heard. Compare these with the inside responses. Are there any you could have heard in a wild place?

2) Read aloud ***The Other Way to Listen*** by Byrd Baylor, allowing time for students to share unusual sounds they have heard or thought of, in nature. You may need to begin with a few examples from your own experience. With older students, ask them to write words for the sounds of snow falling, the sun shining, a worm digging in the dirt, or butterfly wings in the air.

3) Listen to and sing "You Don't Need Ears to Listen" on ***Kid for the Wild*** tape.

Extension:

For additional activities involving the sense of sound, please refer to these three activities in ***Sharing Nature with Children***: Bat and Moth; Silent Sharing Walk; Sound Colors.

Activity 4: Sensory Search

Materials:

Sensory Search list

Pencils

Wildbook, page two

Procedure:

Preparation: Locate a natural area or a park that is easily accessible from your school. Invite extra assistance from parents or older students for this outdoor activity.

1) Explain to students that scavengers are wild animals who search for food using all their senses. In this activity, students will search with their eyes, hands, ears, and noses for the items listed.

2) Go together to the site you have selected. Establish boundaries of the search area, or if you are using a trail, be sure to have a lead and tail adult. Kids love to run off with their lists searching, but it will be easiest for your peace of mind if you or another adult know where they are!

3) Divide into pairs or small groups and distribute lists. Younger students may need a parent or identified reader in their groups. Students are to "collect" with their senses and record findings on their lists with words or pictures. Emphasize the importance of leaving anything living or non-living in its environment.

4) Share what students learned about the outdoors from the things they found on their lists. Discuss possible reasons for the things you have found, where they came from, and what 'use' these qualities or items have in nature. For example, some bright colors & smells attract pollinating birds & insects to flowers; bird songs are a way of communicating territories and selecting mates; and old bones may be gnawed on by rodents as a source of calcium.

5) Conclude with ***Signs Along the River,*** a creative and informational book about learning to interpret evidences of nature in wild places.

6) Complete page 2 in the ***Wildbook***, referencing the objects found on your search.

Extensions:

- Make a tape recording of wild sounds.
- As a writing assignment play **'Mixed-Up Senses'**: Rain *smells* like... Honey *sounds* like... Bird songs *feel* like...
- ***Sharing Nature With Children*** has a longer scavenger hunt and many great ideas involving sensory awareness. This is found in the reference section.

Evaluation:

- On four large pieces of paper write the words "hear", "smell", "touch", and "see". Have students refer to their completed ***Wildbook*** page 2 and record their responses by adding words or pictures of their discoveries to appropriate papers. Older students could refer to these for a writing exercise about the use of different senses.

What a joy it is to feel the soft, springy earth under my feet once more,
to follow grassy roads that lead to ferny brooks where I can bathe my fingers in a cataract
of rippling notes, or to clamber over a stone wall into green fields
that tumble and roll and climb in riotous gladness
—Helen Keller

WORKSHEET #1 - PRIMARY - AESTHETICS

SENSES SEARCH LIST

Something soft

Something hard

Something rough

Something smooth

Something sticky

Something warm

A sweet smell

A smell that reminds you of something else

AESTHETICS - PRIMARY - WORKSHEET #1

An animal track or home

An animal food

3 shades of green

4 different colors

3 sounds from nature

Challenges: Something older than you

Something younger than you

50 of something

2 things exactly alike

PERSPECTIVES THROUGH TIME

Lesson 1: Once Wild

Objective:

- Students will identify features that have probably remained unchanged from a time when the area was once wild.
- Students will understand the history of westward expansion in America, how the landscape has changed and what positive steps have been take to preserve the last vestiges of Wilderness.

Background:

The last 200 years of American development has altered the appearance and use of natural environments to meet requirements for food and shelter for an expanding human population. Some areas were used for growing crops and livestock, harvesting timber, and developing communities. Growing concern about preserving some lands in their natural state can be followed in the "Wilderness: A Brief History!" in the background reference section. The geographic features of mountains, foothills, plains, and rivers have changed little in the past thousand years. This lesson is designed to help students visualize what their community was like before development and some of the changes that have taken place in these areas and with the associated natural resources.

In preparation for this lesson you may need to do some of your own research on the history of your area. Any historical photos or books about the early years of your community will be interesting and will capture imagination.

Activity 1 is based upon reading **A River Ran Wild,** *an environmental history. Activity 2 is an art project for students to create a landscape scene and its changes over time.*

See Also:

- Introduction to Wilderness—(Primary-Overview), Page 47
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Introduction to Wilderness—(Middle-Overview), Page 209
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity 1: A River Ran Wild

Materials: ***A River Ran Wild*** by Lynne Cherry

Procedure: Introduction: Introduce this lesson by asking students if they have heard stories from grandparents or great grandparents about what it was like when they were young. What might a classroom have been like 100 years ago? (Certainly no computers!)

- Looking out your classroom window, what might the view have been like?
- Are there any buildings that are historic near your school?
- Might the area have been agricultural?
- Could you have seen cars or highways?
- What about lawns and trees and houses?
- It might have been similar to wilderness!

2) Read, and discuss ***A River Ran Wild***. The emphasis of this lesson is historical, and also the changes to the river over time should be emphasized. The story also contains other wonderful messages about the ability of individuals taking action to improve their environment.

3) Discuss the following:

- In the first pages of the book was it only the animals that lived *in* the water that benefited from a clean river?
- How were the materials used by the American Indians as illustrated along the border different than those used today? What were they made from?
- How might the settlers have felt about the wilderness? What did they bring with them? How did they use the river?
- How did the river change as factories were built in the area?
- Focus on the differences between the first, middle, and last double page illustrations showing the same view of the river at different times. What evidence is there in each of the illustrations of human actions? Animal life? In which of these illustrations would you most like to live? Why?
- Is there an area in your community that reminds you of this story? What influence do students have on the future of this area? Emphasize that the story shows how development may change an area in ways that are harmful to the environment, or people can work together to find solutions as in this case history.

Activity 2: Shape Art of the Past

Materials:

Large butcher paper
Construction paper (various sizes and colors)
Scissors
Glue and tape
Wildbook, page three

Procedure:

1) Using large butcher paper, cut out basic landforms of your area (hills, mountains, fields) to establish the basis for this activity. If possible create a scene you can see from your school. You may have to do some research before you can do this activity. Explain that these features, plus the plants

and animals that lived here, are what the area once looked like.

2) Provide scissors and papers of varying sizes and colors. Have students look outside at this view and cut out the shapes they see. Have them actually look at what they are reproducing and encourage them to break away from stereotypes...to look at a tree and cut out the shape of it, instead of how they *think* a tree *should* look. It is okay to cut out things from nature and those that are not.

3) After a collection of pieces has begun, arrange them on the butcher paper to create a scene that represents your area. To create depth, put shapes under or in front of other shapes.

4) When you have completed the mural, discuss the following:

- What would it have been like to live here before there was a community? What would be different/the same?
- Where would you have obtained your food? What kind of shelter might you have made? What materials would you have used?
- What natural features would have been here? Mountains? Rivers? Would the plants & animals have been the same?

5) In conclusion, encourage students to observe the place they live. In some ways it might still be like a wilderness and in other ways it has changed dramatically. Wilderness provides us with the opportunity to view what our country was like in the past, and helps to insure that students in the future will have this same opportunity.

6) Complete Page 2 of the ***Wildbook*** by illustrating these differences.

Credit: Art idea for this activity adapted from ***Nature With Art*** by Susie Criswell, l986. Prentice-Hall Inc. N.J.

Extensions:

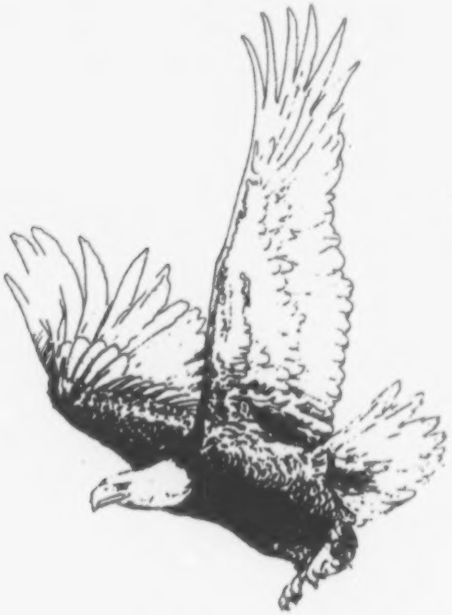
- Bring in historic photos of your area before it was developed.
- Write stories about what it would be like to live in a wilderness as European settlers, trappers, or American Indians. Use the **wolf collage poster** to begin developing these ideas.
- Vary your mural by using only the natural objects first, to create a wilderness scene, then add the man made objects students have created.
- As a writing assignment or discussion, ask students to consider what they would put in a time capsule that would be opened in 100 years to show what life is like here and now.
- Using the book, ***A River Ran Wild***, compare the way land was used from American Indians, to settlers, to the factory, to the clean-up.
- With older students, read selections from your ***State Heritage Series***. One of these books may be included in the Wilderness Box.

PERSPECTIVES - PRIMARY

Note: This lesson is not meant to make a value judgment on the development of urban areas. Rather it is to encourage students to look beyond the urban community to the natural features around them. It is also meant to extend this thinking historically, which may be a challenging concept to cover in an age appropriate way.

Evaluation:

Share and discuss ***Wildbook*** page three or the shape art mural. Have students identify at least one way their surroundings have changed as a result of resource use.



Wilderness Areas preserve the America that was.

—U.S. Forest Service Manual
& Shasta Wilderness brochure

ECOLOGY

Lesson 1: What is Wild?

Objectives:

- Students will describe three basic needs of all animals.
- Students will define differences and similarities between wild & tame animals.
- Students will state in their own words why wild animals need wild places to live.

Background:

Students of this age often have a special interest in animals. They are familiar with animals in zoos, nature films, and their own pets. The activities of this lesson move students from an understanding of the basic needs of all animals to a recognition of the differences between the ways wild and domestic animals meet these needs to an increased awareness of the importance of preserving wild places as undeveloped areas that maintain a diversity of wild species.

This lesson provides several opportunities for communicating with students through the use of the puppets. In your box there should also be a ***notebook of puppet scripts*** *compiled by other classes. Enjoy sharing and adding to this traveling collection!*

See Also:

- Creative Movement for Wildlife Species—(Primary-Ecology), Page 73
- Introduction to Skulls—(Elementary-Ecology), Page 147
- Stories From a Skull—(Middle-Ecology), Page 265

Activity 1: Basic Needs

Materials: Group writing materials

Space

Procedure: 1) There are many ways to introduce the concept of basic needs. If your kids have a basic need to move, try this.

2) Ask students to think of their favorite pet. They will act out this pet as you describe the activities it goes through each day. Begin with all children as animals sleeping. In your description include waking up, stretching, playing, drinking, exercising, interacting with others, eating, keeping warm, and having a bed or shelter.

3) Conclude with students going back to sleep.

4) Have students share the pets they chose and what they did during the day.

5) Next, ask them to think about some of the things they needed when they were pets, and make a list on your paper. Focus student's attention on categories of food, water, shelter, & living space.

6) Explain that these are the same basic needs of people, wildlife, and

domestic animals, though they meet their needs in different ways.

Activity 2: Wild or Not?

Materials:

Magazines (to cut out...old wildlife magazines are great)
Glue
Scissors
Paper

Procedure:

1) Refer to the pets of Activity 1. Compare these animals to wild animals, reminding students that wild animals have the same basic needs, but they take care of themselves in wild places, i.e., predators hunt and grazers find grass and run from predators. Come up with your own definitions for wild & domestic with older students. Have students act out a wild animal walking, hunting, eating, etc. Discuss animals that are predators, hunters or grazers.

2) To evaluate students, name a few animals and have students verbally categorize them as wild or domestic. Tame or captive animals may be a confusing category. These are still wild animals. To help distinguish them, ask the questions: In their natural home, would there be people taking care of them? Could people take care of them in a wild place?

3) Students collect pictures of animals both wild & tame from magazines and/or draw their own. Dividing the pictures may be done in a variety of ways.

- Make two circles of yarn on the floor labeled 'wild' and 'domestic'. Students place their pictures in the appropriate circle and explain why.
- Create two large class collages of these categories.
- Individual students, pairs, or small groups create their own set of collages.
- Older students might make lists of the two groups, or label their pictures.

4) Use the following questions in your discussion:

- What are some of the differences between the two groups? Similarities?
- What about domestic compared to tame animals?

If you are out camping and find a den of baby raccoons, what should you do? What is 'best' for the animals? It is generally best to leave wild animals where you find them, due to difficulty in meeting their needs in a domestic setting, i.e., they can no longer be wild & meet their own needs..

5) Conclude by learning "Wild Things Need Wild Places" on ***A Kid for***

the Wild. Have students share their understanding of how wilderness/wild places are important for the survival of wild animals.

Extensions:

- Set aside time for a story circle, asking students to share their own stories of times they have seen wild animals.
- Visit a natural history museum on a field trip.
- Use Project Wild Activity **"Habitat Lap Sit"** on page 33 of **Project Wild; Elementary**, to reinforce basic needs for people, pets, and wildlife.

Evaluation:

- Ask each student to make a picture of their favorite animal and identify them as wild or tame. Around their animal they should illustrate three things the animal needs to survive.

You wouldn't put a grizzly bear in a rockin' chair, no,
you wouldn't take him to the Mall, cause he wouldn't like it there!

—Jim Stoltz in Wild Things Need Wild Places

Lesson 2: Habitadaptations

Objectives:

- Students will use the example of a beaver to describe two ways in which they are adapted for life in a wilderness habitat.
- Students will be able to identify 10 wild animals in their state.
- Students will describe why wilderness is a critical habitat for wild animals.

Background:

Wild places provide the opportunity to learn about animals in their natural environment. Though some wild animals have become accustomed to urban areas, for example, deer in city neighborhoods and prairie dogs along highways, most species depend on the resources provided in wild places. Habitats can be explained as an animal's address, or where it lives. Adaptations may be thought of as behaviors, or physical characteristics that help an animal make the most of its habitat; how it makes a living.

Activity 1 uses beavers as an example of animals adapted for life in a particular habitat. Activity 2 involves learning about the habitats and adaptations of other wildlife. These activities could be done in either order.

See Also:

- Adaptations and Habitats—(Elementary-Ecology), Page 129

Activity 1: Beaver Adaptations

Materials:

- **Beaver skull**
- **Beaver pelt (skin)**
- **Beaver puppet**
- **Beaver chew stick**
- **Rocky Mountain poster of beaver pond**
- **Beaver Pond Habitat student information sheet**
- **Beaver Adaptations teacher information sheet**
- **Signs Along the River**

Any resource books about beavers

Procedure:

1) Review the basic needs of food, water, shelter and living space addressed in Lesson one.

2) Introduce the word 'adaptation' as something special an animal can do, or a part of its body that helps meet these needs. Discuss some human adaptations: Teeth are an adaptation we have for chewing and hands with opposable thumbs help us hold things. Have students try to unbutton a button, or pick something up, without using their thumbs.

3) Refer to information page **"Beaver Adaptations"**, resource books, the skull,

pelt, chew stick, and puppet as desired. Share ways in which beavers are well adapted for life in a water habitat. They utilize the space & resources of a riparian habitat for food and shelter. For younger kids, you might come equipped with beaver 'adaptations' including a snorkel, goggles, long fur coat, swim flippers, pliers or small saw for cutting trees, and any other beaver-like materials you can think of to compare to actual adaptations. *Note: When you show students the pelt & skull, you may get questions about whether they are 'real'. Both are real and they are in the box to help kids to learn about beavers, though they were not killed for this purpose. Caution students to be careful with the skull, so that other kids may also enjoy sharing it.*

4) Explain to students that in wild habitats, as in urban neighborhoods, we often don't see the residents, but there are many clues about the lives of those living there.

5) Use the **Beaver Pond Habitat** sheet found at the end of this lesson. Refer to ***Signs Along the River*** p. 42 & 43 for the key to this illustration.

6) Ask students to describe an advertisement for a beaver habitat that includes all its basic needs (water, trees, space, etc.). Or have students individually or as a group create a 'recipe' for a wild beaver habitat.

7) Discuss what types of habitats are in wilderness.

Activity 2: Wildlife: Who's Who?

Materials:

Postcards of your state and wildlife

Tape: Kid for the Wild

Wildlife Clues

Procedure:

1) Introduce this activity by having students share experiences in which they have seen wild animals. Encourage them to discuss what the animals were doing and describe their habitat. Explain that in this activity we will be meeting some of the wild animals in their state.

2) Display **postcards** where all students can see them, and tell students you will be acting as if these animals could talk and introduce themselves, without telling students the name of the animal. Observing the photographs carefully to note clues about the animal, it's habitat and adaptations, students should try to pick out which animal you are speaking for. With a class of reading students, you might wish to photocopy the following Wildlife Clues, cut and place on index cards, and have different students serve as the 'narrators'.

3) Conclude by listening to and learning "Wild Things Need Wild Places" on the **"Kid for the Wild"** tape. Extend the examples in the song to a discussion including the post card clues. For example, "Why would it be difficult for an elk to live in your backyard? A pika on a golf course?" You might even create your own verses to add to the song!

The following Postcard Wildlife Introduction Clues *are included here as examples. You may wish to develop your own clues for wildlife present in your region.*

Postcard Wildlife Introduction Clues

Broad-tailed Hummingbird "My eggs are the size of your little finger nail! I have a very long thin bill that is an adaptation for getting nectar out of long thin flowers. I live in forests and near rivers wherever there are these flowers."

Bighorn Sheep "I have two curved horns that grow larger each year and show others how old and strong I am. I live in places in the mountains where there are open spaces and cliffs."

Elk "I have long, branching antlers which sometimes weigh 50 pounds. The old set falls off every year and I grow new antlers. In the fall, if you are in a mountain meadow, you might hear me making a bugling sound."

Mountain Bluebird "Old trees where woodpeckers have made holes, are where I build my nest. I am blue and have a small thin bill that is good for catching insects and feeding my babies."

Marmot "I live in rocky habitats high in the mountains where I feed on plants all summer so I can store up fat to hibernate during the winter. You would be cold in my den, but I am nice and warm with my furry coat."

Abert's Squirrel "I am small and black. I use my long tail to help me balance as I climb in Ponderosa Pine trees to gather seeds and bark for food."

____

Steller's Jay "With a strong bill adapted for feeding on lots of different kinds of food, you can find me in the forests. I have a feathered point on my head that moves up or down when I am communicating with other birds."

____

Black Bear "Long fur keeps me warm when I sleep during the winter. In the summer I eat mostly plants, but sometimes I catch fish."

____

Pika "I am small, but I can make a loud noise. I look kind of like a small rabbit and I live in the high mountains where I eat grasses and seeds." *Listen to the pica song on* ***Kid for the Wild.***

____

Mule Deer "I have big ears and grow antlers that are bone covered with skin called velvet. Mostly I eat the leaves and twigs of small bushes."

____

Coyote "I look like a pet you might have at home, but I am not a pet. I am a very good hunter and can smell small animals though the snow."

____

Golden-mantled Ground Squirrel "I am small and brown, with stripes on my sides that help me to blend in or camouflage with the ground. I have pouches in my cheeks so that I can carry lots of seeds at the same time."

Materials: **Local wildlife habitat poster**
Local field guides

Procedure: 1) Ask students to imagine that they are on a walk in a wild area. The community of plants and animals that use this habitat are illustrated in the poster.

2) Ask students to point out the features as you describe them, prefacing with the phrase "I spy...". Use your local **field guides** for information about these species. Modify the following list for your local area.

- An animal that uses their teeth to cut trees and chew bark. *Beaver*
- 2 animals that fly and are not birds. *Butterflies*
- A herd of animals. *Elk*
- A male of this group that has antlers. *Bull elk*
- A western tanager. A bird with a red head and yellow body.
- A magpie. A bird that is black and white and has a long tail
- A bluebird. *Mountain bluebird*
- An animal that uses gills to "breathe" underwater. *Rainbow trout*
- A small mammal whose brown body and stripes camouflage it on the ground and in the grass. *Chipmunk*
- A flower that attracts hummingbirds. Hummingbirds are attracted to bright colors like red. *Red Indian paintbrush*
- 3 different kinds of flowers.
- The habitats of a meadow, pond, forest, steep cliffs, and snow fields. *Note the different life zones at different elevations illustrated in the reflection of the mountains.*
- A forest of trees that are tall and pointed in shape. *These represent evergreen forests.*
- The leaves of an aspen tree that have changed color from green to yellow.

3) In addition you may wish to have students generate their own "I Spy..." statements for others to search; make up stories about the setting and species illustrated in the poster; or make a list of questions that are raised in this activity and research the answers.

4) Conclude by reminding students that wilderness provides wild habitats for these wild animals.

5) Have students complete the hidden animals search page of the ***Wildbook.***

Extensions:

- Make a chart of the postcard animals, listing food, shelter, and space along the top and the animal names along one side. Students could research and fill in specific squares. ***Animal Friends of the Rockies*** is a good reference for this activity.
- View ***The Last Parable***, a video about wilderness & wildlife of Montana. It is designed for

an older audience, however students may enjoy the excellent wildlife filming.

- Use the **slides** in the plastic page to create your own wildlife slide show.
- Examine other **skulls,** and discuss how these animals are adapted to meet their survival needs. Refer to 'Stories From A Skull' in middle school lessons.
- Use the puppets to create puppet shows about wildlife; their adaptations and habitats. Refer to the **Puppets Scripts & Stories book**. Create a class story and add it to this collection. (Cross reference with Wacky Adaptations in Elementary Ecology, Lesson 1, Page 131.)
- For several extension activities, refer to ***The Wild Watch Book***, with wonderful information and activities about Colorado wildlife.
- Check your library for ***Beaver at Long Pond*** by William & Lindsay George.
- *Beaver People, Grey Owl*, published by MacMillan. *In Beaver World*, Enos A. Mills, University of Nebraska Press. ***Sharing Nature with Children***, Animal Parts.
- Have students research individual animals found in postcard collection and other wild species. Save 'reports' and add to your reading area in a box decorated with students own illustrations or magazine cut outs of the animals.

Evaluation:

Ask students to identify, draw & report on a wildlife species that lives in Wilderness.

Refer to "Who Am I" in ***Sharing Nature With Children***. In this game attach the name or picture of an animal to student's backs. They are then to ask 'yes/no' questions of others who can see their name or picture, about their habitat and adaptations, to determine their identity.

> *Life on earth is a vast, woven fabric of which we humans are but a single strand. To study nature is to become aware of the patterns, colors, forms, beauty, and integrity of the entire fabric. It not only adds to the richness of our lives, but also brings us to an appreciation of how each strand combines to strengthen and support the whole.*
>
> *—Kayo Robertson*

BEAVER ADAPTATION INFORMATION

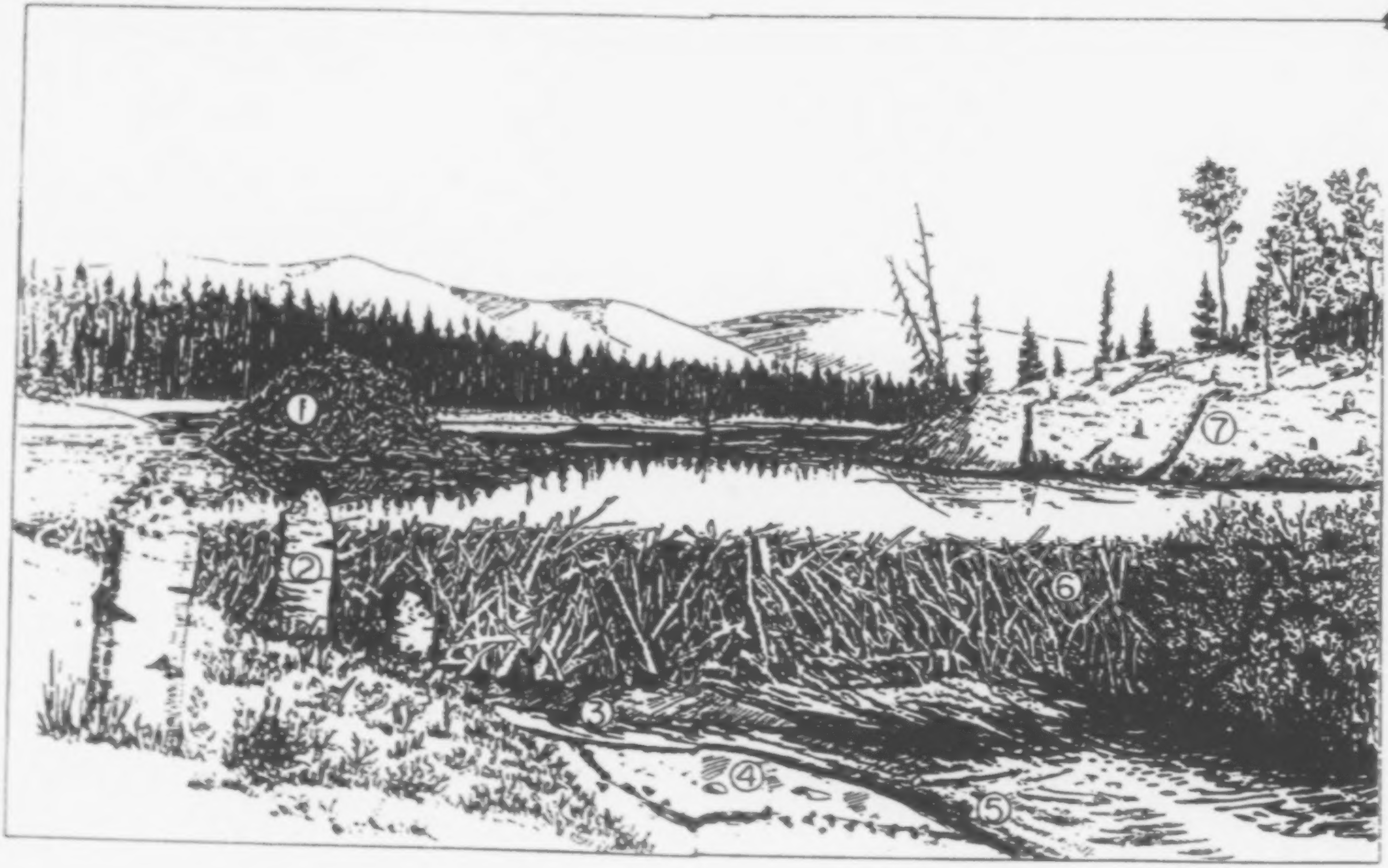
Adaptation	Use
Nostrils on top of head	breathing while swimming, and smelling potential predators
Eyes on top of head	viewing what is above
Long & strong front incisors	chewing twigs & bark for food gnawing trees for construction of dam and lodge
Ever growing teeth (incisors)	replace worn down by gnawing
Ears small	streamlined in water
Lips close behind teeth	ability to hold, carry & chew underwater
Thick fur	warmth in water
Tail	rudder when swimming alarm when danger fat storage
Hind feet	webbed for swimming
Front feet	dexterous like hands, for grasping materials

Wild Animal Search Key

(Illustration of hidden animal key to be pasted here)

ECOLOGY - PRIMARY - WORKSHEET #2

BEAVER POND HABITAT



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Lesson 3: Creative Movement for Wilderness Species

Objectives:

- Students will increase their knowledge of the habitats, adaptations and life histories of two animals frequently associated with wilderness.
- Students will closely express this awareness through creative movement.

Background:

The following lesson is excerpted from an excellent creative movement curriculum designed by Karen Kaufmann (of the Drama/Dance Dept. at the University of Montana) for teaching students about threatened and endangered species in Montana. An age appropriate teaching method, it is included here to provide an active learning experience involving the habits and habitats of species whose lives are closely connected to wild places.

Activity 1 involves a movement investigation that teaches students about the life of a young bald eagle. With a wing span of up to eight feet bald eagles are often associated with wilderness settings. They prefer to nest in tall trees near water with little human activity. Habitat destruction, illegal shooting and pesticide poisoning have reduced their numbers to receive endangered status in many parts of the lower 48 states.

In Activity 2 students learn about the life cycles of grizzly bears, whose large habitat requirements accompanied by low reproductive rates and conflicts with humans, have caused their numbers to shrink dramatically in response to westward expansion and development. In both of these activities students will learn specific information about the animals and gain a sense of these species' dependence upon wilderness habitats. You may wish to collect your own references for more information about bald eagles and grizzly bears or refer to "Eagles" or "Bears" ***zoobooks.***

See Also:

- What Is Wild?—(Primary-Ecology), Page 61
- Introduction to Skulls—(Elementary-Ecology), Page 147
- Stories From a Skull—(Middle-Ecology), Page 265

Activity 1: The Life and Times of a Bald Eagle

Materials:
Carpet squares (enough for 1/child)
Sticks, twigs, and leaves
Gym, large room, or outdoors
Eagles zoobook

Procedure:
1) The following terms will be used in this activity. Practice these movements individually or to discuss their meaning before you begin the narrative.

Movement Vocabulary:

- Fold & Curl Up
- Lift
- Stretch
- Drop
- Shake
- Squat
- Curve
- Drift
- Flap
- Climb
- Poke
- Fly
- Raise
- Pluck
- Focus
- Soar
- Jump
- Land Gently
- Peck
- Perch
- Push
- Grab
- Scratch
- Turn
- Open/Close
- Tilt
- Pull

Other Vocabulary:

- Talons
- Spawning
- Majestically
- Air Pockets

2) Each child begins the lesson on their carpet square with sticks, twigs and leaves around them symbolizing their nest. When all students are ready, begin the narration.

Bald Eagles live near water. They build large nests high up in the tallest trees. Imagine you are a small downy eaglet—less than 2 inches long—still inside your egg. Your are all curled and folded. Feel how tiny you are. The smooth sides of the egg are surrounding you. Now it's time to hatch from the egg. Begin to peck with your beak against the egg. You have managed to crack the egg. Move your beak against the egg again and again so that you make a hole big enough to poke your head through. Begin to try to open and stretch your wings and legs and slowly, with a great deal of effort, you push your way out of your shell.

Imagine how it feels to be a baby eaglet suddenly out of the egg! Now that you've hatched you find yourself in a large nest 150 feet above the ground. Your parents are there to protect you and bring you food.

Your mom feeds you small pieces of food from her beak. Raise your head expectantly while you await the prey your mom has brought you. Your mom tears it into small pieces and drops a piece right in your mouth.

As you sit in the nest you preen yourself as you wait for your parents to bring you food. Shake your head out very quickly with back and forth movements. Your foot scratches your neck. Imagine your two hands are your clawed feet. Lift a claw to scratch and clean your feathers. Your sharp curved beak cleans your feathers too. Move your mouth down to your shoulders and preen yourself.

As the baby sits in the nest it looks out for mom, turning its head. As you turn your head and look imagine you are seeing far, far off into the distance with your keen eyes. Now blink your eyes slowly and when you open them again you will once again see very, very far away.

Your clawed feet curve around the sticks and branches in your nest. Open and close your feet. Can you make your feet feel clawed? Imagine long, sharp finger nails on the ends of your claws. These are called talons.

As you watch your parents fly in and out of the nest you are getting ready to fly yourself. Open your wings very wide and close them. Now let your wings flap quickly, forward and back. Your are standing in your nest practicing wing movements. You practice by flapping your wings very quickly and jumping up and down in the nest.

Now that you are two or three months old you are ready to take your first flight. Climb up onto the edge of the nest and flap your wings forward and back until your wings lift you off. For your first flight you soar a short distance to a nice perch where you make your first landing. You preen and dress your feathers, feeling very excited about your first flight. Hop up and down and stretch your wings. At first you will leave the nest only briefly. Fly back to the nest.

Eagles are fish eaters. As you sit on your perch you search for fish with your sharp eyes. Now you leave your perch and fly over the water. When you spot a spawning salmon you fly low over the water. Drop down to the waters surface and grab the fish with your feet, plucking him out of the water. Fly to a perch to devour your tasty fish.

When eagles are not fishing they sit very majestically in tall trees, looking out over miles of country. Squat low, as though you are perched on a branch with you back very straight and tall. Be very still. Now turn your head slowly, peering out over the miles of countryside.

Now lift yourself up and begin to soar, high up above the land. When eagles fly they swoop and soar and drift along, effortlessly, on air pockets. Make your movements very smooth. As you move throughout our room land lightly on your feet with a forward motion (not up and down). Gently tilt one wing down in order to turn. When you are ready to land fly back to your perch. Land on it and pull your large wings in, folding your lower arms in, hand to arm pit then elbow to waist. Your back is long and straight as you perch majestically—"King or Queen of the Birds."

3) In conclusion ask student what the land looked like that they were 'flying'. Note that all birds of prey have exceptional eyesight at great distances. Ask students what they might have seen if they were an eagle. What did they feel or hear? This could begin a language activity of writing from the perspective of an eagle.

4) If you were an eagle looking down at the earth from the sky, would you be able to recognize wild areas? How?

Activity 2: Grizzly Bear Habits and Habitats

Materials: Gym, large room or outdoors

Props or signs to establish three areas within the movement space:
forest, river, mountain.

Bears zoobook

Procedure: 1) Review the following terms.

Movement Vocabulary:

Dig
Capture
Sniff
Lie
Scratch
Collect

Lick
Look and Run
Gallop
Roll
Paw
Relax

Reach Out Quickly
Lope and Lumber
Lift and Turn Head
Rise and Drop
Search
Sleep

Other Vocabulary:

Delicacies
Uninhabited

2) Have students select a place in the "mountain" area to serve as their den, from which they will begin their movements. Use the following narrative:

Grizzly Bears live high up in the mountains in the heart of wilderness areas. There are no roads or buildings or houses. Only tall mountains, valleys, rolling hills and forests, streams and rivers.

When young bears—cubs—are born they live in a cozy den. For the first year of their life they stay close to their mothers to learn how to eat, drink and sleep. Imagine that you are a tiny bear cub, and you and your mom are coming out of your den.

Mom teaches you to dig up roots. Feel your sharp claws digging at the roots.

Now she shows you a patch of ripe huckleberries, one of your favorite delicacies. Imagine you are eating berries off the vines. Let your tongue capture berries which squish between your teeth.

Sometimes you might be lucky enough to catch a mouse or squirrel. Your paws have to reach out quickly to capture a moving mouse. Often the mouse escapes—sometimes you catch it. Find the squirrel with your eyes and run toward it. Again turn your head, find the squirrel and run toward it.

Now that it is summer you are going to travel up to the higher country to find more food. You lope and lumber on all fours through the forests and hillsides. Sometimes your sharp ears hear something, so you stop and lift up on your two back legs, sniffing the air. Lift and turn your head as you sniff the clean air. Drop down to all fours again and lumber through the forests.

Again, stop and lift up on your back legs. Turn your head and sniff. What might you hear as you listen?

On all fours again you gallop up to a high mountain river. Stand by the river and put one paw in the icy water. Can you catch a fish with your claws? Remember, fish are slippery and sometimes slip out of a bears claw. When you capture a fish put it in your mouth and walk on all fours over to a smooth rock to feast on it. Some bears like to fish from the river—others like to wade in and swim as they fish. Find your own favorite way to fish.

Now it's time to lie in the sun to dry off. Find a nice spot for yourself to rest and roll around. Roll on to your back with your four paws up in the air and scratch your back on the floor. Your mom and brothers and sisters and you are a close family. Often you all play together, pawing at each other, sniffing and rolling around. Move into groups of three or four and begin to sniff and playfully paw at one another. How might the bears play? Roll onto your back and gently tussle with your brothers and sister.

While you are young your family stays together, but when you grow up you'll be off on your own. Leave your family and go off on your own now to find food. You'll keep lots of space between you and the other bears now, always moving into the wildest, uninhabited country. You have to get a lot of food because it is becoming fall and getting time for your winter sleep. Have you gotten enough to eat? Maybe you can catch a mouse or find some flowers or dandelions to munch on.

Begin to search for a good site for your den. When you find it collect mosses and branches and evergreen boughs to make it nice and cozy. You will sleep the long, cold winter in here so make sure its well padded and comfortable.

Now enter your den and close off the door with your boughs and branches. Lie down and relax. You will be able to live off the food you ate this year so you won't need to do anything but sleep for the next four to five months.

Relax giant Grizzly Bears, for when spring comes you will wake up and begin to find food again.

3) Conclude by discussing some of the reasons grizzly bears are endangered. What are some ways people can enjoy wildlife without seeing them or adding to the causes that make them endangered? Could a grizzly bear survive in your community? In a city park? A writing exercise from the point of view of a grizzly bear visiting your community might be humorous as well as thought provoking.

Credit:

Activities taken from ***Creative Movement for Threatened and Endangered Species*** by Karen A. Kaufmann of the Drama/Dance Dept. at the University of Montana, for the Montana Threatened and Endangered Species Trunk Project, 1991.

Extensions:

- Share a version of the American Indian story "Jumping Mouse" in connection with bald eagles. This story can be found in ***The Earth Speaks*** published by the Institute for Earth Education. Read ***Bear*** by John Shoenherr, a wonderful picture book about a young grizzly bear.
- Listen to "It Ain't Easy Bein' An Ol' Grizzly Bear" on ***Kid for the Wild***.
- If you have an eagle and/or bear puppet in your box, use them to create a puppet show about the connections between these animals and wilderness.

Evaluation:

- Observe student actions. After activities ask students to share one thing they learned about these animals and why they are considered wilderness species.

When the grizzly is gone, we shall have lost the most sublime
specimen of wildlife that exalts the western wilderness.

—John McGuire, founder of Outdoor Life Magazine

CONNECTIONS

Lesson 1: Wilderness Impacts

Objective:

- Students will describe two ways that human pollution and litter are harmful to the environment.
- Students will describe two ways that human actions can help sustain the natural features of their community or wild places.
- Students will create at least one rule or policy to help protect wild places.

Background:

The emphasis of these activities is to encourage students to consider ways in which our actions are connected to wild places, and environmental quality. Whether in an urban or wild area, pollution, including litter, causes changes in the environment that have an undesirable effect on living & non-living things.

Activity one begins with students discussing & defining the inappropriateness of litter. It provides an introduction to the next activity of specific lessons about pollution in the **Woodsy Owl Environmental Education Leader's Kit**.

Woodsy Owl and his associated slogan "Give a Hoot, Don't Pollute" has been developed by the US Forest Service as a "symbol...to promote wise use of the environment and programs which foster maintenance and improvement of environmental quality." In keeping with the objectives of the Wilderness Box Curriculum, to promote understanding of the connections and consequences of human interactions with natural environments, Woodsy's age appropriate lessons have been inserted into Activity 2.

Activity 3 involves students in decision making about actions that may harm or help wild environments. Activity 4 focuses more specifically on environmental quality in wild places, and concludes with a responsive writing project in the Wildbook.

See Also:

- Leave No Trace—(Elementary-Skills), Page 191
- Leave No Trace—(Middle-Skills), Page 341

Activity 1: No Place For Litter

Materials:
Feely Bag
Natural Objects
1-3 Pieces Of Litter (bottle cap, gum wrapper, plastic, etc.)

Procedure: 1) Mix objects in the bag. Have students draw out one at a time and tell the group whether the item belongs in a wild place or not. Discuss questions such as:

- Why does or does not the item belong there?
- Does it do anything to "help" plants or animals?
- What would happen if it stayed on the ground for 10 years? 100 years?
- Does it have a 'use' or a 'job' in nature?
- Where does it come from?

Note: It is improtant to explain to students that these objects are specimens and have not been collected or taken from wilderness or wild places. These specimens were ordered from a catalog.

2) Create a class definition for litter as something that is not from nature. It is harmful to living things and our environment.

Activity 2: Woodsy & Wilderness

Materials: Space

Procedure: 1) Remind students that people often have to make choices about things they do that will hurt or help their environment, whether they are in a city or a wilderness.

2) With older students, discuss the following actions in terms of harm to the living and non- living features of the environment. The "Litter Facts" Woodsy poster is a good reference for this activity.

With younger students, explain that they are going to be Woodsy's owl friends who are observing someone doing something in a wild place. You can act out these phrases or simply say them. Students may 'fly' or stay in one place. When you describe something that is good for plants, animals, and people they should "hoot" as a way of communicating their own, and Woodsy's approval. When you describe something that is harmful, they will be quiet and sit down, or hoot alarmingly.

Note: Different kinds of hooting can symbolize different actions or signals. For example, calm cooing vs. alarmed hooting used for a warning.

Action Descriptions

Picking flowers in a wild place (No. It may take away an animal's food source, and also makes it so that others who come after you can not enjoy these flowers. Flowers in your own garden or yard often may be picked but those in the wild should be left.)

Throwing a very small candy wrapper on the ground (No. This is not okay anywhere. Litter is unpleasant to people & some kinds of litter may harm wildlife.)

Putting trash in a garbage can or packing it out with you (Yes! Always be responsible for your trash.)

Washing your dishes in the river when you are camping (No. This pollutes the river. It is best to wash dishes far away from water sources. Most soils will have purifying action on soaps.

Soaps that are biodegradable are best.)

Giving your sandwich to a ground squirrel (No. Wild animals have their own food sources that are healthy for them. It is also possible to get bitten by an animal mistaking your finger for food!)

Carving your name in a tree (No. Injures tree and is unsightly for other visitors.)

Planting a tree (Yes! Trees help to 'clean' the air through photosynthesis, and provide habitats for animals.)

Any other scenarios you can think of!

Activity 3: Wilderness Writing

Materials: Page six of ***Wildbook***

Writing & illustrating materials

Procedure:

1) Review the importance of keeping land wild, so that other people can enjoy the same places in their natural state, and plants and animals may continue to live in healthy environments.

2) As a response to the previous activities, direct students to write about their awareness on page six of the ***Wildbook*** in one of the following ways:

- Write a recipe for a wilderness you would like to visit. Start with clean water and air. Add natural features to create your wild place. What can you do to keep it that way?
- Write a story about a way you could help stop pollution.
- Write a set of 'ethics' (or 'policies') you think people should follow to keep wild places and the earth a cleaner place to live. Younger students could draw pictures or narrate to an older writer.

Extensions:

- Arrange with your local US Forest Service office to have Woodsy come and visit your classroom. It is a great costume complete with movable eyes! Students could write invitations to Woodsy telling him what they have learned from this lesson.
- Write a puppet script about how animals are affected by pollution and how people may help make their environment a healthier place. Use puppets from box or make your own.
- Read and discuss the books included in the box. ***The Lorax*** and ***The Last Bit Bear*** are best with older students. ***A River Ran Wild*** is understandable for all ages. All of these stories provide perspectives on pollution and connections to human actions.
- On ***A Kid for the Wild*** "River, River, River, Run" goes well with water pollution.

Evaluation:

- Use the actions described in Activity Two to evaluate student learning. Have students suggest other scenarios that might help or harm their immediate surroundings as well as wild places.

Give a hoot, don't pollute!

—W. Owl

SKILLS

Lesson 1: Wilderness Skills

Objective:

- Students will describe five essential items to take with them on a day hike, and what to do if they become separated from an adult in a wild place.

Background:

Some children may think little of the difference between going on a day hike and a trip to the store. For other children the thought of going into a wild place may connote scary animals and dark nights spent out lost and alone. The following activities provide students with knowledge of ways in which they may be safely prepared for and enjoy a day outing in a wild place.

Activity 1 can be done with your own equipment and expertise, or it is a great opportunity to involve natural resource manager or interested parent. Invite them to visit and bring their own backpack and experiences into your classroom. Activity 2 emphasizes safety measures, and also provides knowledge of what to do when lost. Activity 3 involves students in preparing a simple trail snack, 'gorp'. Activity 4 describes ways of wrapping up your unit.

See Also:

- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary-Skills), Page 185
- Wilderness Decision-Making and Group Dynamics—(Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: To Bring or Not To Bring?

Materials: Check your hall closet, garage, basement, & kitchen for these items:

Optional
Field guides
Camera/binoculars
Pocket knife (adult use only)
Matches (adult use only)

Essentials
Poncho or raincoat
Water bottle
Extra food
Whistle
Wool shirt or sweater
Backpack (large or small)

Inappropriate
Dictionary (field guides are lighter)
Tape player
Electric toy
Canned food (heavy)
High heeled shoes

Map (with person able to read it!)
First aid kit
Sun screen/hat/glasses

Procedure:

1) Review the basic needs of all animals including ourselves and discuss how people meet these needs when they are in wild places. Brainstorm some things you might bring to meet these needs.

2) Use your own style of presentation or dramatics to divide materials into those that should go on an all day hike and those that should stay at home. Play the foolish hiker, dress in inappropriate clothes, and come into the classroom with a huge bag of all the materials described above. Discuss each item and have students sort materials into two piles explaining their reasoning as they do so. Some important considerations are usefulness, weight, and the item's ability to meet basic or safety needs. Emphasize preparedness as a way of safely enjoying the outdoors.

3) Conclude by making lists of items to bring, leave, or those that are optional. Some classes might enjoy making up their own skits using these materials.

Activity 2: Don't Forget

Procedure:

1) Discuss the information described below as you lay out the items described in Day Hike Basics on the floor.

2) To play the "Don't Forget" game, cover the items with a cloth and remove one item while students eyes are closed. Students open their eyes and you uncover the items. Have students guess which item is missing and discuss the possible consequences of forgetting this item on a day hike.

Day Hike Basics

First Aid Kit	In wild places a long way from your home or school, it is good to have one member of the group carry a first aid kit with basic supplies.
Extra Food	Light, high energy snacks with little packaging are best, for replenishing energy and keeping you warm, in case the trip is longer than planned
Water	It is easy to get dehydrated when exercising outdoors, and water from natural sources should not be used unless treated for giardia and other microorganisms that cause intestinal illness.

Sun Protection	Especially at high altitudes, overexposure to sun can cause severe sunburn.
Extra Clothes	Mountain weather can change quickly. The warm weather clothes you start out with may not be adequate for cooler temperatures or higher elevations.
Poncho or	Essential for rain or wind protection. Many students may not have these items.
A Rain Jacket	A large trash bag with hood created out of hole in bottom, is an innovative and inexpensive emergency item. If you share this with your class **be certain** to distinguish between this activity and simply putting a plastic bag over your head!
Whistle	To be used only in an emergency to help locate a lost person.

Tell someone where you are going and for how long.

---

3) This is a good place to emphasize preventative safety, i.e., staying with the group, being prepared for changes in weather, or being out longer than planned. Convey to students that if they are lost and cannot see a trail, road, or any signs of other people they should stay where they are. They should make themselves comfortable and remember that someone will come looking for them. If they hear people calling they should always answer...they won't get in trouble for being found!

Activity 3: Group Gorp

Materials:

Measuring cups
Large mixing bowl
Small plastic bags
M&M's
Peanuts
Oyster Crackers
Raisins

Procedure:

1) Mix the above ingredients such that you have a total amount based on approximately 1/2 cup/student. Discuss why you are adding the ingredients. M&M's provide non melting source of sugar and fat, which is metabolized more slowly. Peanuts are a protein and a fat source, oyster crackers for salt and starch, and raisins travel well and provide quick sugar.

2) Mix and divide into bags. From here the math possibilities are endless, including sorting and graphing as students investigate their own gorp bag. Save for your hike, or eat as a class snack. Show examples of bar graphs, dot graphs, horizontal graphs, etc.

Activity 4: Pack Your Pack

Materials:

Wildbook Page 6 and 7
Wildbook last page
Illustrated backpack and basic items worksheet following this lesson
Scissors
Glue
Coloring materials

Procedure:

1) Distribute illustrated backpack and basic items worksheet, and associated

Wildbook Page 89. Students color and cut out backpack and all items, then **glue sides and bottom of backpack only**, to center of ***Wildbook*** page 94, leaving top open to insert other items.

2) As students "pack their packs" by inserting items into the top opening between the pack and the page, they should share with a friend their reasons for taking them.

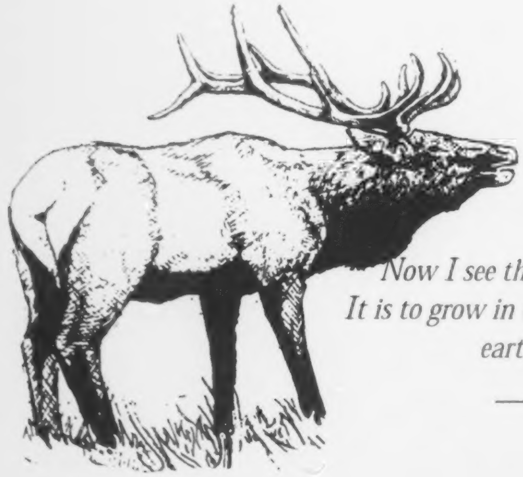
3) If you have not done so already, distribute the back cover of the ***Wildbook***.

Extensions:

- Read ***Lost Lake*** about a wilderness hike taken by a father & son. *Note that the practice of building large campfires is not promoted in wilderness. It might be interesting to have a discussion with students about this, referring to the illustration in the book. Reference* ***Leave No Trace*** *and other related materials included in the box. (i.e., What is wrong with this picture?)*
- Take a field trip/hike! This is a GREAT way to conclude your unit.
- Arrange for a natural resource staff person, or parent to visit your class and take a hike/walk in your area. Share the projects, books, and activities you have done during this study unit with them and have them share stories of their outdoor experiences.
- Check your library for a recent publication ***Lost in the Woods*** by Colleen Politano (published by ICS Books Inc., Merrillville Ind., 1993) to read to students.
- Refer to the Elementary Curriculum "Skills" lessons for additional ideas that may be adapted to suit your age group. For example, the Impact Monster skit, found on Page 192.

Evaluation:

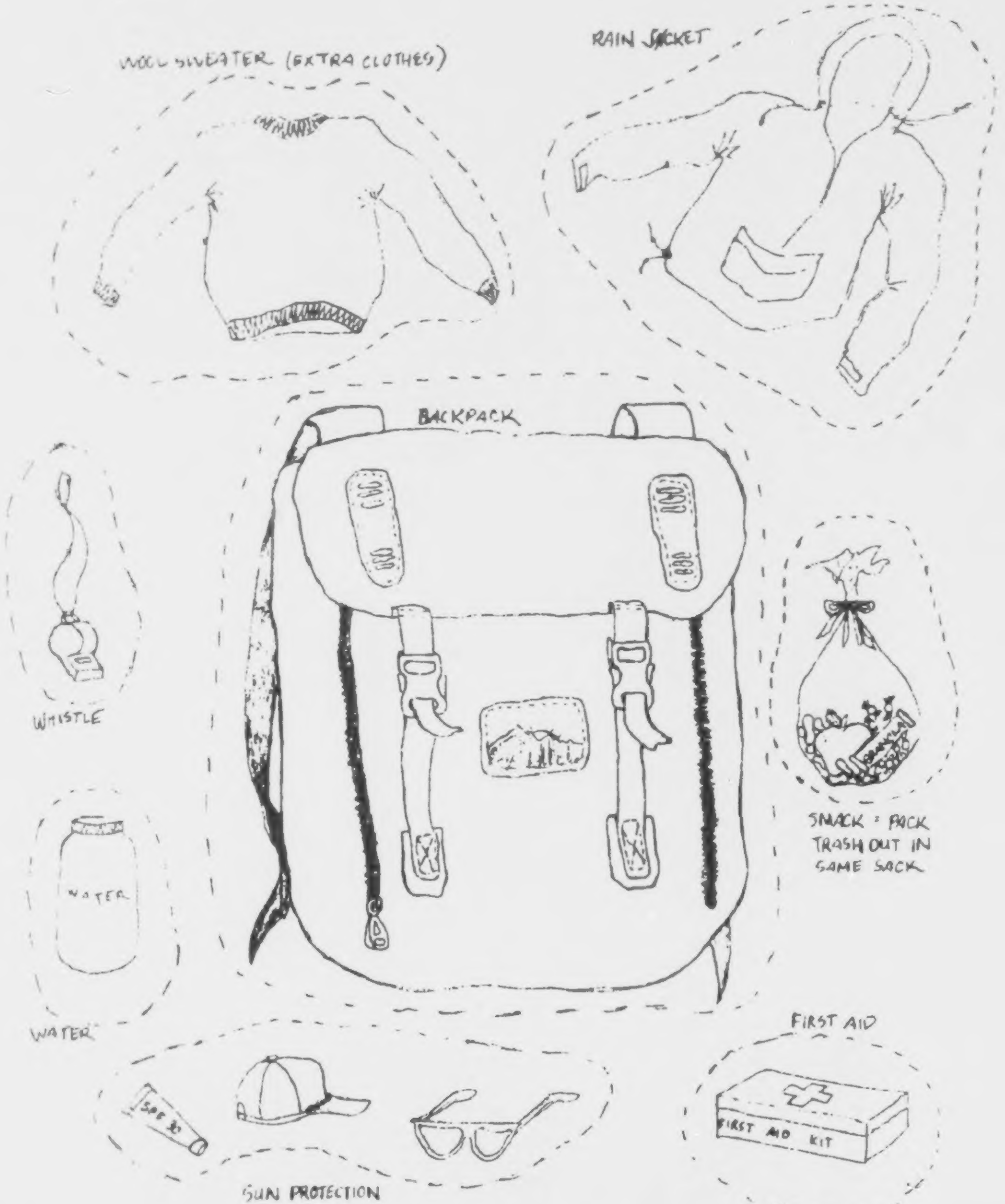
- Ask students to share with their classmates five things they would take in their backpack for a day hike, as described in activity four. Ask students to describe in their own words what to do if they become lost.



Now I see the secret of the making of the best persons.
It is to grow in the open air, and to eat and sleep with the earth.

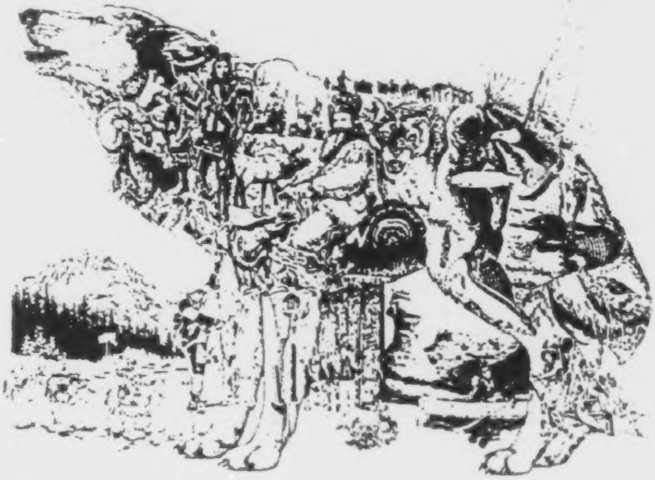
—Walt Whitman

PACK A PACK WORKSHEET


WOOL SWEATER (EXTRA CLOTHES)
RAIN JACKET
BACKPACK
WHISTLE
SNACK + PACK TRASH OUT IN SAME SACK
WATER
WATER
FIRST AID
FIRST AID KIT
SPF 30
SUN PROTECTION

The Wilderness

Wildbook



Have you ever been to a place where there are no cars or houses or streets or stores or anything made by people? Have you ever been to a place where there are only wild plants and animals? This kind of a place is called a Wilderness.

This book is all about Wilderness.

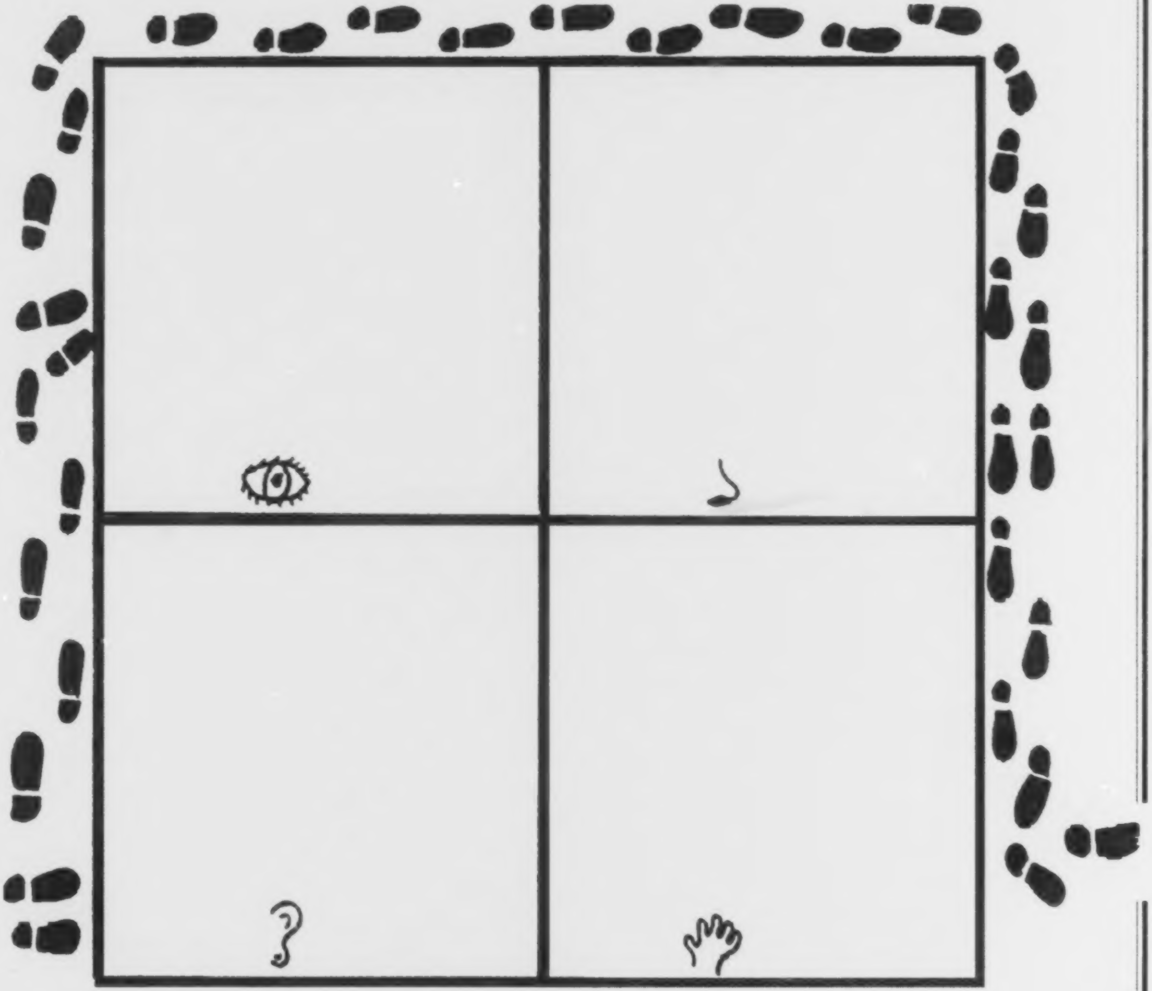
It belongs to:

An interactive workbook for kids learning about Wilderness.
Follow the footprints to learn more about Wilderness.

SKILLS - PRIMARY - WORKSHEET

2

In wilderness and anytime you are outdoors you can use your hands, eyes, nose, and ears to learn about where you are.



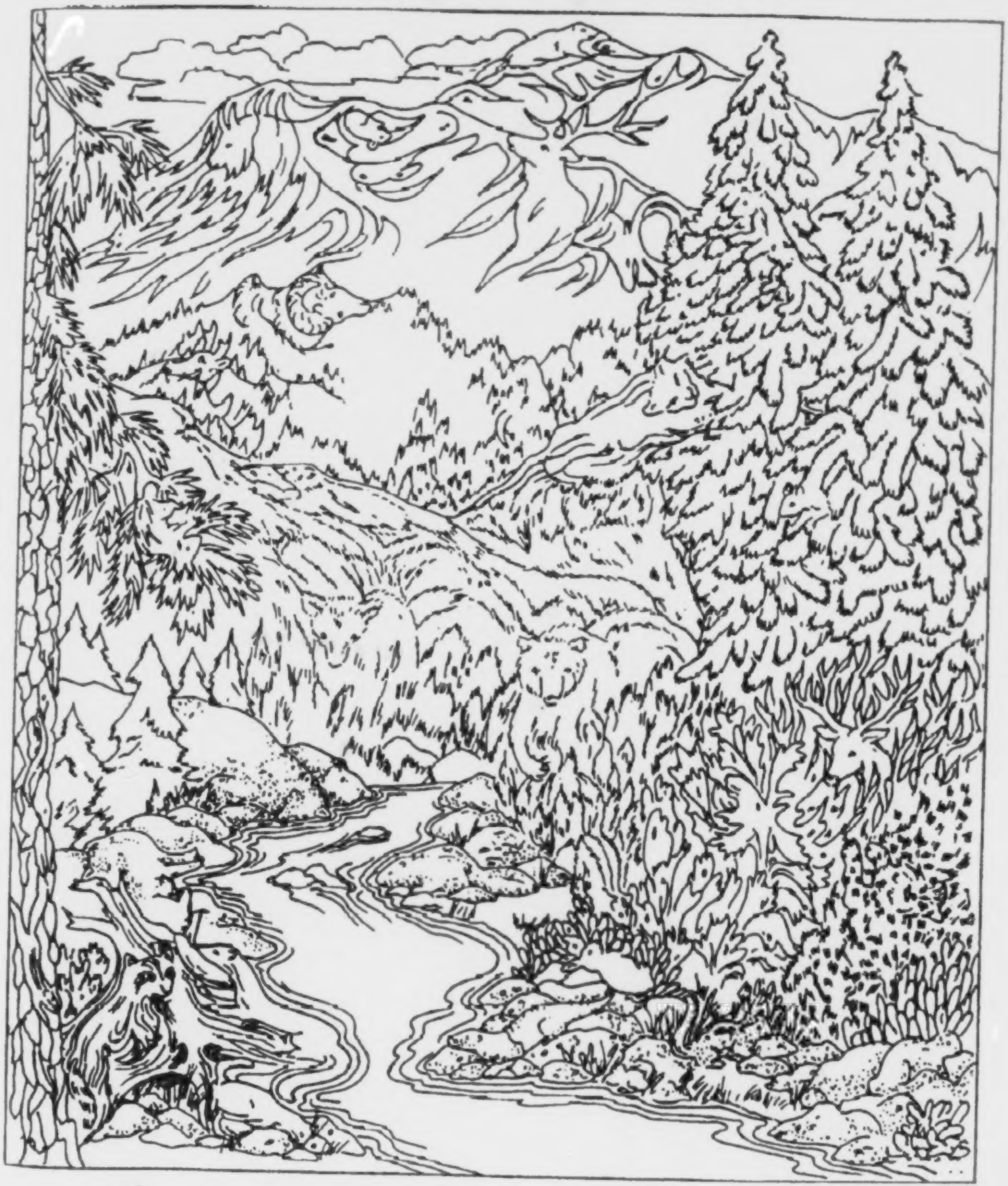
In each square make a picture of something outdoors you learned about with that part of your body

Where you live there are some things that are the same as Wilderness and many things that are different than Wilderness.

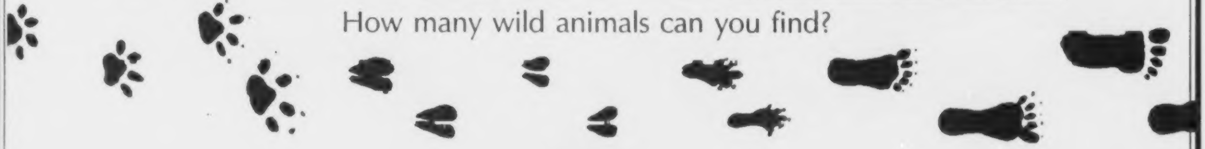
Make a picture of yourself and where you live.

4

Wilderness is a place for wild animals to live.

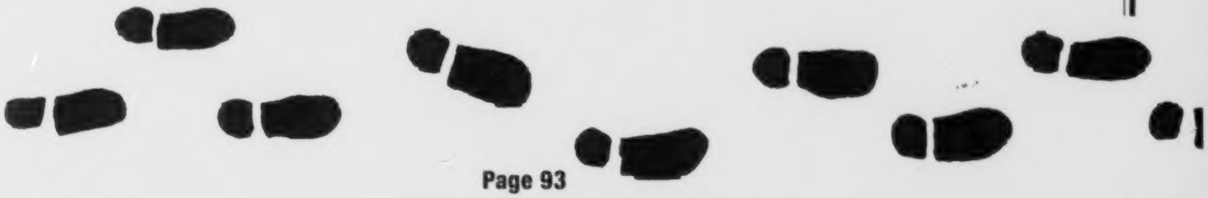


How many wild animals can you find?



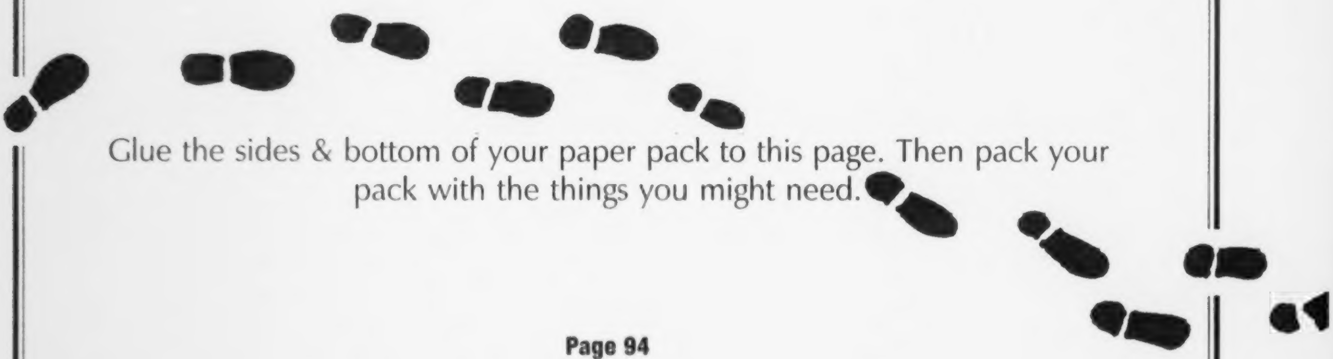
Wilderness is a place where there is clean air and water. It is important that people take care of these places and the earth so that it will be a healthy place for all living things.

This is your page to write or draw about how people can help keep wild places clean.



6

To be safe and enjoy hiking, these are some things to take in your pack.

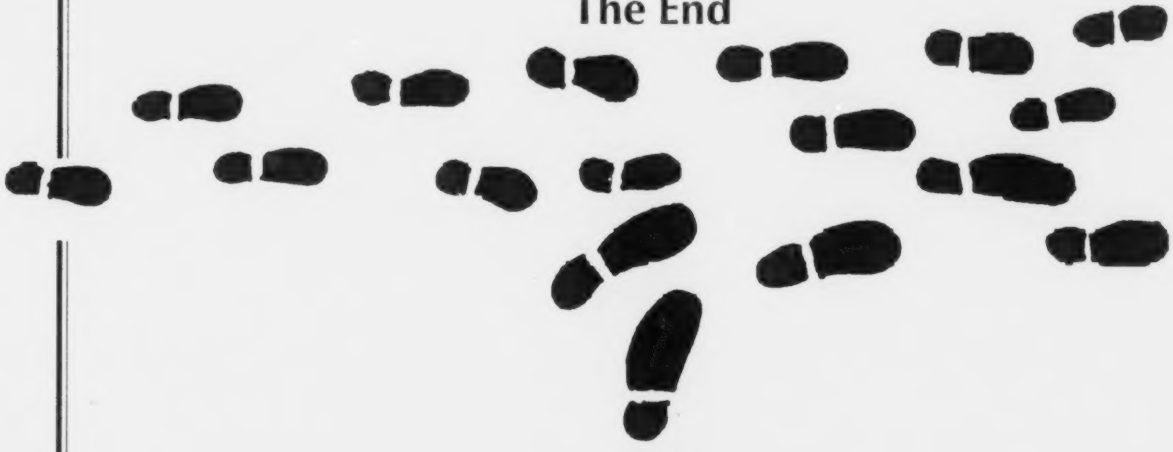


Glue the sides & bottom of your paper pack to this page. Then pack your pack with the things you might need.

One job of Backcountry Rangers is to take care of Wilderness Areas. These places are special because lots of people care about them.

You have learned alot about Wilderness! Share your book with a friend and enjoy Wilderness.

The End



LEARNING CENTER ACTIV

Arrange your classroom to provide opportunities so that a num
ducted simultaneously.

Dramatic Play

- Set up a tent and provide props of backpacks, cooking imp
  bags, maps, compass, binoculars, camera, flashlights, cand
  any other props to make this area like a wild campsite.

Art

- Paint a large mural/backdrop of a wild scene to be used be
  on an empty wall.
- Provide pictures of wild places that students can look at w
  calendars are a great resource for these.
- Supply paper bags and materials for creating animal puppe
  readings.
- Older kids may enjoy making shoe box dioramas of wild p

Writing Center

- Provide magazines with pictures of wild places that may be
  or book with words written by/for students.
- Have students bring in photos of themselves in wild places
  about them.
- Provide writing and drawing materials that may be used fo
  imaginary trip to a wild place.

Sensory Table

- Create animal track blocks from wood blocks and adhesive
  shape of hooves, toes, or claws (refer to your local mamm
  tions). These shapes may be used in damp sand to make tr
  observing animal signs.
- Provide sticks, rocks, twigs, gravel and small plastic animal
  table.

Building Center

- Cut open large trash bags and provide string, scissors, and
  make their own outdoor shelter with these materials.

Book Center

- Collect books about wild animals, wild places, and childre

ITER ACTIVITIES

s so that a number of activities can be con-

cks, cooking implements, blankets or sleeping
flashlights, candles, stuffed animals (wild), and
ld campsite.

e to be used behind your dramatic play area or

s can look at while drawing or painting. Old

g animal puppets or characters from your

ramas of wild places.

ces that may be cut out and put into a collage

s in wild places and write descriptions or stories

may be used for creating a book about an

ks and adhesive *Dr. Scholl* mole foam cut in the
ur local mammal field guide for track illustra-
sand to make tracks as students learn about

ll plastic animals to create wild habitats in the

g, scissors, and blocks. Challenge students to
materials.

ces, and children exploring the outdoors.

e 97

GUIDELINES & IDEAS FOR PUPPET USE

Puppets are a wonderful tool for communicating with children. Primary children identify with them as characters separate from the speaker. Elementary children can enjoy the dramatics and creativity involved in creating puppet shows. Middle School students might use puppets in performances for younger audiences. The puppets included in the box are for you and your students to use in a variety of ways.

You may find that once on your hand the animals develop a character and voice of their own, conversing with other puppets and the students. They can convey factual information about themselves and their interactions with their environment, or they may become 'co-presenters' with an instructor as a second voice to teach activities from the curriculum.

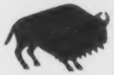
Recognizing the value of sharing good ideas and the sense of pride that comes from knowing others will view your work, the ***Puppet Scripts & Stories notebook*** included in the box is a compilation of works from different groups using the box. If you would like to contribute to this collection, please add copies of your script or story that relates to wilderness directly to the notebook that will stay with the box. Copies should be easily read and include your class/group name, school, and teacher/instructor.

Factual information about the animals may be gained from local natural history guides. The following ideas are suggestions for ways to use the puppets to enrich the concepts covered in the curriculum.

- In presenting information, use a puppet to speak with or for you.
- Use a tape player and microphone to interview puppets about their thoughts on wilderness.
- Interview puppets about their specific adaptations, habitats, and community interactions.
- Distribute puppets to students and have them write stories about them and their connection to wilderness.
- Students research information about the animals and present 'puppet autobiographies'.
- Combine with ***Kid for the Wild*** *tape*, a puppet stage with student created backdrops and present a full audio-visual performance for another class!

So that others may continue to enjoy using the puppets in good condition, please handle them with care and return them to the storage bags in the box. Thank you!

ELEMENTARY SCHOOL LESSONS For 3rd-5th Grades

Elementary **STRAND**	**OVERVIEW**	 **AESTHETICS**
GOAL	**To be able to describe some attributes of wilderness, and know that wilderness must be preserved and managed.**	**To experience personal aesthetic values from Wilderness and wild things through writing, drawing, and other creative activities.**
OBJECTIVE(S)	Students will explain five concepts or feelings they associate with wild places. Students will describe how wild lands are an important part of our national heritage and a source of pride for Americans. Students will examine the spiritual value that many feel in wilderness. Students will locate and label classified Wildernesses in or near their state.	Lesson 1 Students will experience wildness with all senses and express the experiences in words and drawings. Lesson 2 Students will describe five things that they like and five things that they need from wilderness.
LESSON Activities	Lesson: Introduction to Wilderness (Page 105)* Activity 1: Wild Words Activity 2: Wilderness Slide Show (elementary script) Activity 3: *The Last Parable* (video)	Lesson 1: Sensory Awareness in Wild Nature (Page 109) Activity 1: Back to Back Drawing Activity 2: Blind Investigators Lesson 2: Natural Resource Values (Page 111) Activity 1: Personality Shield Activity 2: Reliance Activity 3: Journaling: First Thoughts Activity 4: *A Kid for the Wild* (audio cassette)

Elementary

STRAND	PERSPECTIVES	ECOLOGY
GOAL	**To be able to generally place the Wilderness preservation movement in the context of history and personal history.**	**To understand food chains and interrelationships between biotic and abiotic components of wild environments.**
OBJECTIVE(S)	Lesson 1 Students will describe two ways that natural resources were used by American Indians and early settlers. Students will describe one way resource use today is similar to and different from resource use prior to 1900, and will be able to write a brief statement about how this change relates to Wilderness preservation. Lesson 2 Students will list important events in the environmental preservation movement and when they occurred in relation to dates of personal or historic significance.	Lesson 1 - Students will understand adaptations as specific survival mechanisms contributing to species diversity. Students will recognize the associations between adaptation and habitats. Students will understand if habitat is reduced or changed, species diversity will be reduced. Lesson 2 - Students will give two examples of specifically adapted plants and animals that fill certain interdependent niches in an ecological community. Students will identify the roles of at least four different species within a sample food web. Students will be able to describe one way that wilderness preservation helps to sustain community interaction between wild species. Lesson 3 - Students will correlate skull characteristics with feeding habits and identify the different roles of these mammals within a community. Students will be able to identify three different skulls as carnivores, herbivores, or omnivores to define these terms.
LESSON Activities	Lesson 1: Living in the Wilderness (Page 119) Activity 1: American Indian Resource Use Activity 2: Making A Homestead Lesson 2: Wilderness Act History (Page 127) Activity 1: Citizen Action: The Wilderness Act (from *Green Scene*)	Lesson 1: Adaptations and Habitats (Page 129) Activity 1: Birds and Bills Game Activity 2: Wacky Adaptations Activity 3: Adaptations Game Activity 4: Endangered Species Lesson 2: Community Connections (Page 141) Activity 1: Community Strength: Chains and Pyramids Activity 2: Community Web (Page 147) Lesson 3: Introduction to Skulls

Elementary **STRAND**	**CONNECTIONS**	**SKILLS**
GOAL	**To gain an awareness of the direct impacts of litter and air and water pollution on wilderness and the need for wise use of resources.**	**To begin to gain skills in outdoor cooking, map use, clothing selection, safety and Leave No Trace.**
OBJECTIVE(S)	Lesson 1 - Students will be able to give one example of a connection between their daily liFe and natural resources. Students will recognize the importance of sound land management practices and its connection to environmental quality. Lesson 2 - Students will be able to describe how air and other forms of pollution cross Wilderness boundaries and be able to give examples. Students will be able to name two ways that they can help reduce air pollution. Lesson 3 - Students will describe the water cycle. Students will locate on a map geographical water supplies. Students will describe one way in which water pollution is detrimental to environmental quality and quality of life.	Lesson 1 - Students will understand that a map is a representation of land forms and terrains. Lesson 2 - Students will be able to explain the characteristics of good food rations, and describe how to prepare several simple recipes. Lesson 3 - Students will identify the most common fabrics used in backcountry clothing and describe several of their advantages and disadvantages. Lesson 4 - Students will know basic "Leave No Trace" techniques of backcountry use addressing pre-trip planning, backcountry travel, campsite selection and restoration, use of campfires and camping stoves, cooking and sanitation, horse use and courtesy for other wild land visitors. Lesson 5 - Students will understand that good decisions lead to self-reliance in wilderness. Students will recognize that group members take on different roles in making good group decisions.
LESSON Activities	Lesson 1: Words From the Lorax (Page 155) Activity 1: From Pencils to Dinosaurs Activity 2: The Lorax Lesson 2: Wild Air/City Air (Page 159) Activity 1: What is Air Pollution? Activity 2: Wilderness Boundaries and Air Pollution Lesson 3: Wild Water (Page 163) Activity 1: Water Circle Activity 2: Upstream Clean Activity 3: Keep It Clean for Downstream	Lesson 1: Basic Map Skills (Page 177) Activity 1: A Special Waterfall Activity 2: Map in a Box Lesson 2: Wilderness Rations Planning (Page 181) Activity 1: Gorp Preparation Activity 2: Granola Preparation Lesson 3: Wilderness Fabrics and Clothing (Page 185) Activity 1: The Polar Explorer Activity 2: The Great Wet Sock Experiment Lesson 4: Leave No Trace (Page 191) Activity 1: The Impact Monster Skit Activity 2: *Soft Paths* (video) Lesson 5: Wilderness Decision-Making & Group Dynamics (P. 199) Activity 1: Lost in the Wilderness

OVERVIEW

Lesson 1: Introduction to Wilderness

Objectives:

- Students will explain five concepts or feelings they associate with wild places.
- Students will describe how wild lands are an important part of our national heritage and a source of pride for Americans.
- Students will examine the spiritual value that many feel in wilderness.
- Students will locate and label the classified Wildernesses in or near their state.

Background:

This lesson is designed to introduce students to the idea of wilderness. The first activity is simply a word association game to encourage students to think about what wild means to them. There are no wrong answers, and a discussion can really help to open up a new world of thinking. The ***Wilderness Slide Show*** *provides an array of wilderness slides from the National Wilderness Preservation System.* **The Last Parable** *video is a beautiful elaboration of traditional American wilderness values and feelings. Its wildlife shots are truly captivating for every age audience.*

See Also:

- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Introduction to Wilderness—(Middle-Overview), Page 209
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity 1: Wild Words

Materials :	A Blackboard maps
Procedure:	1) Ask students to write down five or more words they associate with wilderness. Write all the words on the chalkboard. 2) Explore the feelings associated with the word wild: How does the word make you feel? 3) Now add "erness". Wilderness areas are **places** that are wild. What does that mean? You can use a national forest or state map to point out the wilderness areas.

4) Talk about the roots of the word wilderness, meaning wild; will, to have will.

5) Have them write a short story using as many of the words on the board as possible (optional).

6) What are some things you do that are wild? Are cities wild?

Extension:

- Categorize words. This gives more possibilities when writing a story and teaching grammar. Examples:

Noun	Verb	Adjective	Adverb
mountains	rumble	majestic	lively

Activity 2: Wilderness Slide Show

Materials: **Wilderness Slide Show**, Screen, Slide projector

Procedure: Read the introductory script and show the slide program. Have the students look for diversity of ecosystems, plants, animals, recreational activities, etc. A worksheet accompanies the script.

Extension

- Have students view the slides, then pick out music they feel brings out the values and beauty of wilderness. Then play the music with the slides for more of an aesthetic approach.

Evaluation:

- Have students discuss the different ecosystems they saw. Ask:
  - What plant types were in the slide show?
  - Name the different animal species?
  - Why is wilderness important?
  - What types of recreational activities were shown?

Activity 3: The Last Parable (video)

Materials: ***The Last Parable*** video

VCR and monitor, dictionary

Teacher Information page, ***The Last Parable*** discussion questions

Procedure: 1) Complete the "Wild Words" activity and watch the Wilderness Slide Show as prerequisite student background information before conducting this activity. Some of the concepts in this tape will be difficult for elementary students. However, the image of humans as "the unicorn," in search of our home, our roots, and ourselves, in the wilderness is one that they can understand with some interpretation.

2) Ask students to look up definitions in a dictionary for these words: myth, legend, story, and parable.

3) View ***The Last Parable*** video with students.

4) Make up your own discussion questions or use the questions that accompany this activity.

Extension:

- "Wild Words" can be extended by creating a "word web," spatially connecting the words that students generate on the board, with descriptions of their connections and relationships. After seeing ***The Last Parable***, consider returning to the words generated in Wild Words. Ask the students if any of their feelings about these words have changed. What words would the wilderness travelers in the video have used to describe wilderness?

Evaluation:

Evaluate short stories students write in Activity 1: Wild Words.

Use discussion questions as an evaluation of what students have learned about wilderness and wildlife.

THE LAST PARABLE DISCUSSION QUESTIONS

1. List at least 10 wildlife species viewed in the video.

   Possible responses:

   -sage and sharp tailed grouse
   -coyote
   -badger
   -golden eagle
   -mule deer
   -grizzly bear
   -great blue heron
   -mountain goats
   -water ouzel
   -moose
   -trout
   -trumpeter swan
   -pronghorn antelope
   -elk
   -fox
   -Canada goose
   -whitetail deer
   -black bear
   -cedar waxwing
   -bighorn sheep
   -river otter
   -bald eagle
   -wood ducks

2. Explain how you felt when you watched the grizzly bear chase down the elk calf.

   Possible response:
   Answers may vary

3. Share a special wild place you have visited, or would like to visit.

   What was it like?
   What did you like best, least?
   What kinds of wild animals did you see?

AESTHETICS

Lesson 1: Sensory Awareness in Wild Nature

Objective:

- Students will experience wildness with all the senses, and express the experiences in words and drawings.

Background:

The first activity in this lesson promotes observation, description and communication skills. Teachers should encourage students to work slowly. Focusing on ***description*** *and* ***composition*** *helps many students gain a perspective and understanding of objects, processes and issues which can greatly enhance the experience of wild nature.*

Using different senses is often difficult unless a dominant sense has been taken away. Temporary loss of smell during a cold is an example. The second activity deliberately removes sight from the students' experience. It has been found that for humans, up to 80% of our total sensory information flow can come from sight. To remove sight requires other senses to take the place of the eyes. Smell, touch and sound are enhanced as ways of experiencing nature.

The final activity is a scavenger hunt. To be truly effective, it really should be conducted outside, but many wild objects can be found right on an urban school yard! Teachers should plan to do some creative investigating beforehand in developing the list of objects to be retrieved.

See Also:

- Wild Wise—(Primary-Aesthetics), Page 51

Activity 1: Back to Back Drawing

Materials:

Paper

Markers

Natural objects found in the wild such as pine cones, rocks, leaves, bark, shells, fossils, etc.

Procedure:

1) Have children bring an object from nature to class. Let them know they will need to be able to describe this object and not to let others see the object.

2) Divide students into pairs.

3) The students will sit back to back with one person holding the object and the other prepared to draw.

4) The object should be described without mentioning its name. The student holding the object should describe its size, shape, weight, color, texture and what it reminds them of.

5) While listening to the description the drawing partner illustrates what he/she hears.

6) Have students compare the drawing and object. Switch roles and repeat this activity with another object.

7) Ask students if this was difficult. Why or why not?

Credit: This activity was adapted from Criswell, Susie Gwen. (1986). *Nature with Art.* Englewood Cliffs, N.J.: Prentice-Hall.

Activity 2: Blind Investigators

Materials: Clean Blindfolds (Bandanas work well)

10-15 natural objects, placed at stations around a fairly large room

Procedure: 1) Set up the room with as many stations as needed with a natural object at each station.

2) Have students get into pairs.

3) Explain that one person will be blindfolded and the other will be the "guide", leading the blindfolded person to half of the stations (at least 5).

4) There should be no talking, and they must hold hands the entire time.

5) Have the guide "show" the object to the blindfolded person. The blindfolded person should touch, smell and listen to the object to get a clear picture of what it is, and then take a guess! If the blindfolded person can't get it in three guesses, the team should move on. No peeking until the end.

6) Switch roles half way through.

7) After the pairs have investigated each station, have each team report on their experiences. Encourage them to revisit stations that they couldn't guess, now with sight. Discuss the thoughts and the thinking process that students applied in trying to "see" or understand the object.

Extensions:

- A nice extension for Blind Investigators is to tag six trees in a wooded area, two of which are the same species. The blindfolded student tries to guess which two of the six are the same. Interest in tree identification is sometimes piqued during this activity.
- The scavenger hunt can be extended as a homework assignment, where each team member is assigned by the group an object to bring back the next day.
- With younger students, read ***The Other Way to Listen*** and ***Signs Along the River*** from the Wilderness and Land Ethic Box.

Evaluation:

Sharing of student reports and experiences. How did students figure out what the objects were?

I think I could turn and live with the animals, they are so placid and self-contained.

—Walt Whitman

Lesson 2: Natural Resource Values

Objective:

- Students will describe five things that they like and five things that they need from wilderness.

Background:

This lesson focuses on developing a greater awareness of one's own values about wilderness and the natural world, and what we do there. It also begins to teach the processes of discovering feelings. The opening activity begins with recognizing parts of the self that are treasured. In the second activity students are asked to examine how basic needs are satisfied through contact with the natural world.

Skills in self-examination are then refined through an introductory journaling exercise. Not only is journaling fascinating, it develops much broader perspective. Observations of patterns, contrasts, and feelings are helpful in our understanding of the world. Much of the information we have about nature and history comes from journal writers of the past. John Wesley Powell's marvelous accounts of his trip down the Colorado River tells us much about the people and culture of that era. It also invites us into the deep mysterious world of the Colorado River gorge. John Muir, who endlessly rambled through the mountains of the Sierra Nevada, leaves us with vividly beautiful descriptions of plant, animal and geological life as well as a deep spiritual insight into the mysteries of the natural world. Pioneer women of the westward movement have left behind a legacy of journal entries which take us back to a time much different than ours, and reveal secrets of an unheard past. Beginning with this lesson, students can become inspired to write, draw, compose, sketch, draft, and dream on paper. ***Journaling can also be used as an extension for almost any of the Wilderness and Land Ethic Curriculum.***

The final activity is a sing-along with the ***A Kid for the Wild*** *tape. The songs are a fun way to help reinforce positive feelings and values about wild things and places.*

See Also:

- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Where Do You Stand?—(Middle-Aesthetics), Page 227
- Wilderness Values—(Middle-Aestheticss), Page 233
- My Side of the Mountain—(Middle-Aesthetcis), Page 237
- Wild By Law—(Middle-Perspectives), Page 261

Activity 1: Personality Shield

Materials: Drawing paper
pen, pencil, markers, crayons, etc.

Procedure:

1) Read background information on **"The Medicine Shield" (Page 115)** and **"The Power of the World Always Works in Circles" (Page 116).** Share this information as it relates to the activity.

2) Distribute drawing materials and have students either trace their hand on the

paper OR draw a large circle.

Procedure: 3) Suggest questions to be answered by illustrations in each of the fingers or directions of the circle. Suggested questions:

What is your favorite wild animal, or wild place?

Which is your favorite season?

Who is your hero/heroine?

What makes you happy?

What represents the real you? (usually in the palm or center of the circle)

4) Open this activity up for discussion or allow students to reflect on their choices personally, depending on the students' comfort level. Discussions might involve concepts of self, symbols, personality, or how they feel in nature.

Activity 2: Reliance

Materials: Paper,

Markers or crayons

Procedure: 1) Ask students to draw a picture of themselves in the very center of the paper.

2) Have students draw pictures to answer the following questions:

Where would you find the cleanest water and air?

Where does your food come from?

Where can you go for "peace and quiet"?

What is your house made of, and where did the material come from?

Where does your garbage go?

3) After students have completed their drawings, ask them to share them with the rest of the class, explaining their work.

4) Make a chart on the chalkboard with a category for each question and record each student's response. Try to draw conclusions in a class discussion as to what we need to survive.

Extension:

Ask students to complete the same exercise assuming another role as an animal, tree, rock, lake, river or mountain, etc.

Activity 3: Journaling: First Thoughts

Materials: A Journal. Students can make their own by stapling together scrap paper and making a cover, or you can require them to buy an inexpensive one.

Procedure: 1) From background information, discuss the historical and personal values of journaling with students. Journaling can be scary for many people. To find a gentle way to inspire student writing, introduce the idea in an enthusiastic and personal fashion. Be a role model and consider keeping a journal yourself!

2) Pick a period of time. (10, 20 or 30 minutes.)

3) Read the following rules to the students:

- Keep your hand moving
- Don't cross out
- Don't worry too much about spelling, punctuation, grammar.
- Lose control
- Don't think. Don't get logical.
- Write whatever comes up. You don't have to share this with anybody but yourself.

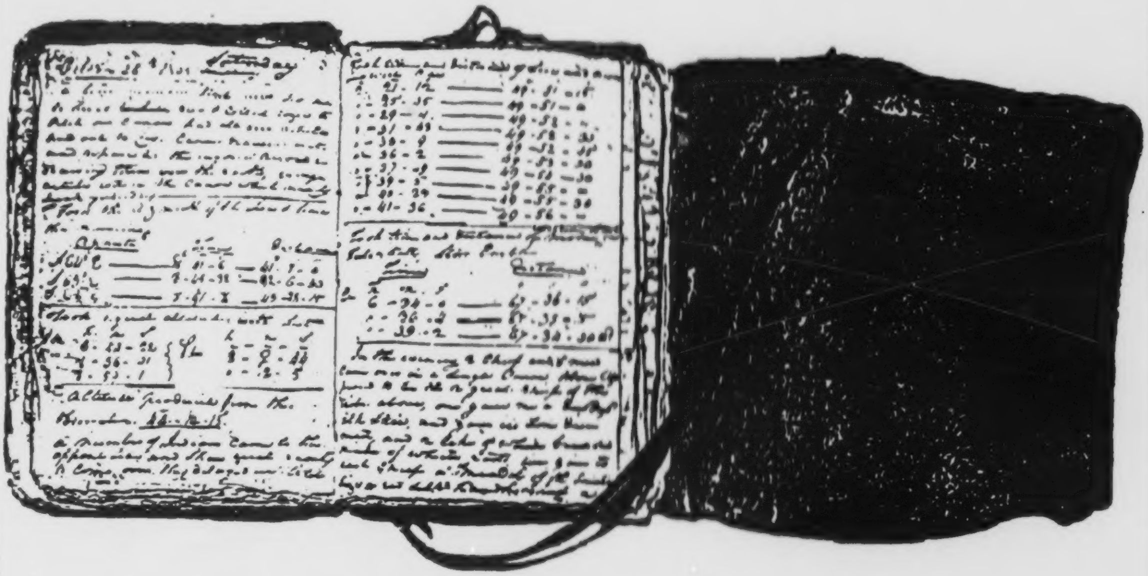
4) At the completion of the writing time, ask for volunteers to share their thoughts. If no one offers, that's okay. Encourage students to write on their free time.

Credit: Adapted from information in ***The Use Me Guide: A Staff Resource Guide for the University of California at Santa Cruz Wilderness Orientation Program*** by John McConnell

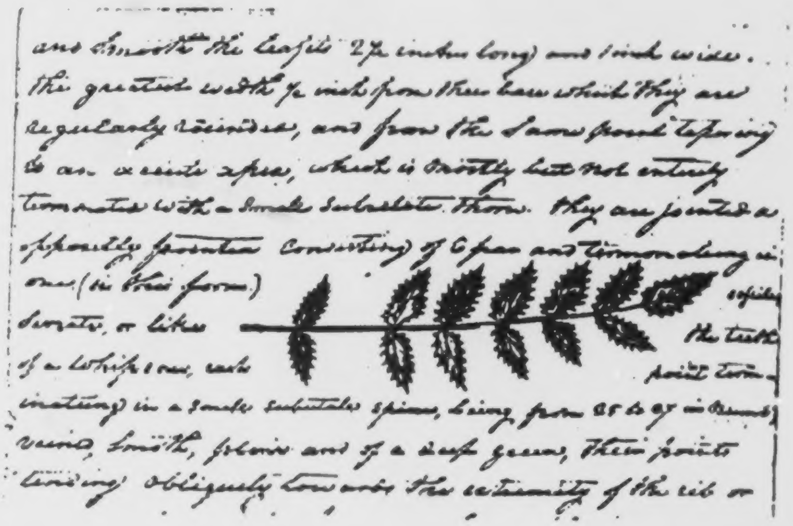
Writing Down the Bones by Natalie Goldenburg

AESTHETICS - ELEMENTARY - STUDENT/TEACHER INFORMATION

This notebook, bound in elkskin, is one of the original journals kept by Lewis and Clark. The entry for the 26th of October, 1805, contains several columns of figures recording the positions of the sun and moon—the explorers way of determining their exact location.



Clark's description of an Oregon grape leaf growing along the Pacific Coast included measurements down to a fraction of an inch.



and smooth the leafets 2¼ inches long and 1 inch wide. the greatest width ½ inch from their base which they are regularly rounded, and from the same point tapering to an accute apex, which is mostly but not entirely terminated with a small subulate thorn. they are jointed & oppositely pointed consisting of 6 pair and terminating in one (in this form)

serrate, or like
of a whipsaw, each

[illegible]
the teeth
point term-

inating in a small subulate spine, being from 25 to 27 in number; veins, smooth, polished and of a deep green, their points tending obliquely towards the extremity of the rib or

THE MEDICINE SHIELD

The Medicine Shield is an expression of the unique gifts that its maker wishes to impart about his or her current life journey. A Medicine Shield can speak of a new level in personal growth, or it can illustrate the next mountain a person wishes to climb.

Traditionally, the shield a warrior carried spoke of the inner strengths he would use to help the tribe. The shield of a native woman spoke of her gifts of nurturing and her talents in the areas of vision, healing, weaving, magic, singing, dancing, beading, etc. Shields spoke of their bearers' places in the tribal family and of the totems they carried.

By invoking recognition for the gifts of another, the Medicine Shields were a way to create harmony in the family, tribe, and nation. Shields spoke of the inner truths as well as the outer personalities of their makers. Each woman made her own shield. Each man would choose a brother who honored his own medicine to make his shield. This was to prevent the male ego from getting in the way of truth. Women made their own shields with humility and creativity.

To lie about your gifts was a great disgrace. To lie about anything, for that matter, could cause permanent exile from the tribe. Those who had lied and been exiled usually found jobs serving white men as guides, or assisting the cavalry as interpreters. Shields that had lied were burned in a ceremony of great mourning, and the makers of these Shields became invisible to the others of the tribe and nation.

Many times a shield would be made for the initiation of a project, and would contain the desired outcome. Other shields would be made to tell stories of a battle, a hunt, or a Vision Quest. When a special ceremony was to be celebrated, a shield would be made to depict the joy of the tribe and the spirits that would interact with the people. Shields were made as talismans for easy births, abundant harvests, or as signs of rites-of-passage into manhood or womanhood.

When a marriage was to take place, the shields of the bride and groom were placed opposite their respective owners in order to reveal the inner secrets of the partner's soul to the intended. After the bride and groom had jumped the fire together, the shields were hung on lances that crossed and joined as one on the door of the wedding lodge.

Every shield carries medicine. Through its art and self-expression, each shield is the essence of a time and space that carries certain aspects of knowledge. All persons carry shields of the lessons they personally learned from the four directions on the Medicine Wheel. These lessons can be inclusive of their strengths and weaknesses, their talent and gifts, and their visions, purposes, and places in life. The totem of each direction can be expressed through a feather, a paw print, a symbol, or a piece of the totem animal's horn, tooth, bone, hide, fur, or fin.

Source: ***Medicine Cards-The Discovery of Power Through the Ways of Animals***,
Jamie Sams & David Carson, Bear & Company, P.O. Box Drawer 2860,
Santa Fe, NM 87504

THE POWER OF THE WORLD ALWAYS WORKS IN CIRCLES

Background Information:

Black Elk Speaks-Interpreted by John Neihardt

You have noticed that everything an Indian does is in a circle, and that is because the Power of the World always works in circles, and everything tries to be round. In the old days when we were a strong and happy people, all our power came to us from the sacred hoop of the nation and so long as the hoop was unbroken the people flourished. The flowering tree was the living center of the hoop, and the circle of the four quarters nourished it. The east gave peace and light, the south gave warmth, the west gave rain, and the north with its cold and mighty wind gave strength and endurance. This knowledge came to us from the outer world with our religion. Everything the Power of the World does is in a circle. The Sky is round and I have heard that the earth is round like a ball and so are all the stars. The Wind, in its greatest power, whirls. Birds make their nests in circles...The sun comes forth and goes down again in a circle. The moon does the same, and both are round.

Even the seasons form a great circle in their changing, and always come back again to where they were. The life of a man is a circle from childhood to childhood and so it is in everything where power moves. Our tipis were round like the nests of birds and these were always set in a circle, the nation's hoop, a nest of many nests where the Great Spirit meant for us to hatch our children.

Source: ***The Earth Speaks***, Edited by Steve Van Matre and Bill Weiler, Published by The Institute for Earth Education

Activity 4: A Kid for the Wild

Materials: ***Kid for the Wild***, audio cassette by Jim Stoltz on Wild Wind Records

Audio cassette tape player and sound system

Lyrics sheets (optional, Master is in the Wilderness Box)

Procedure: 1) As a fun follow-up to the above exercises consider doing a sing-along! Many of the songs on Stoltz' tape will help students to verbalize feelings that they have about the wild. For example:

"I like to play in the water,
I love to splash about.
And sometimes I wish that I was a fish,
A fat and sassy ol' trout!
—River, River, River Run

Note: *It also helps to validate these feelings to know that Stoltz, and the student's teachers and friends feel the same way sometimes. Consider* Slugs and Bugs; River, River, River Run; Come Walk with Me; *and* A Kid for the Wild.

2) One way to structure this activity is to hand out copies of the lyrics. The first time through the song, students read along silently and learn the tune. The second time through, everyone sings. Once everyone knows some of the songs, they can serve as a "closure" activity at the end of any lesson.

Extensions:

- Encourage students to read journals of important people in history.
- Provide students with the opportunity to write a story, poem, or play, compose a musical or movement piece, create a new idea, or make a video production or photographic portfolio about their feelings for wilderness and other special places.

Evaluation:

It is difficult to objectively evaluate the activities in this lesson. As a teacher, be a good role model to encourage students to express their feelings about the natural world. Create a comfortable learning atmosphere to conduct these activities.

What a joy it is to feel the soft, springy earth under my feet once more, to follow grassy roads that lead to ferny brooks where I can bathe my fingers in a cataract of rippling notes, or to clamber over a stone wall into green fields that tumble and roll and climb in riotous gladness!

—Helen Keller, The Story of My Life

PERSPECTIVES THROUGH TIME

Lesson 1: Living in the Wilderness

Objective:

- Students will describe two ways that natural resources were used by American Indians and early settlers.
- Students will describe one way resource use today is similar to and different from resource use prior to 1900, and will be able to write a brief statement about how this change relates to wilderness preservation.
- Students will understand the history of westward expansion in America, how the landscape has changed and what positive steps have been taken to preserve tha last vestiges of wilderness.

Background:

Our daily lives involve the use of natural resources in innumerable ways, though today in an industrialized society, our connections to these resources may be less evident than in the past. These activities encourage students to consider ways in which people of the past relied directly on the environment to meet their needs.

This lesson should be connected to the present day concept of wilderness through discussion of how increased human populations have necessitated the managed use of natural resources in some areas, and preservation of wild lands in others. Before the westward expansion movement, several different tribes of Native Americans occupied the mountains and plains of the Rocky Mountain region. They utilized natural resources in a variety of ways. Some tribes constructed cliff dwellings and grew crops. Others like the Utes and Arapahoes moved seasonally through the mountains between hunting grounds. Their lives were inextricably linked with the environment in which they lived and so are ours.

Early settlers from the east traveling west brought few tools and supplies needed to face the challenges of providing for themselves in an undeveloped land. They met with vast expanses of prairies, high mountains, and seemingly unlimited resources. Availability of water, soil for crops, construction materials, in some cases minerals, and the topography of the land determined, to a great extent, where and how these pioneers made a living.

Additional historical information is described in the middle school curriculum "Perspectives" information sheet (Page 249). For further background concerning state history, please consult your local library.

See Also:

- Introduction to Wilderness—(Primary-Overview), Page 47
- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Introduction to Wilderness—(Middle-Overview), Page 209
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity/American Indian Resource Use

Materials: Resource/reference materials about early American Indians of your state

Large paper

Animal pelt, obsidian rock (replica)

Procedure: 1) Brainstorm with your group, or use the list on the left of the next page, to identify societal needs; things that help us meet our needs or enrich our lives.

2) Generate another list (same large piece of paper) of all the natural resources that would have been available from which to meet these needs in the early 1800's. Use the pelt and obsidian as examples of natural resources and their potential uses. (The obsidian or 'volcanic glass' has a sharp edge and could be used in making fine points or knives.) Your two lists should look something like those included below:

Needs	Natural Resources
Food & Water	Rocks
Shelter	Soil
Recreation/Toys	Water
Medicine	Trees
Clothing	Plants
Transportation	Animals
Tools	
Art	
Music/Entertainment	

3) Divide students into groups to research different needs. Each group selects two to four specific examples of things that could meet this need. Next they identify all the natural resources that would be involved in it's creation. An example of clothing could be a dress made of deer hide. To obtain the hide from the *animal,* a bow and arrow made of *wood & rock* (arrowhead) would be needed.

Clothes
◊
Deer Hide
◊
Bow & Arrow
◊
Wood/Rock

As a variation, groups could research different tribes and investigate how the resources available in different environments affected the technological and economic components of a tribe. Another way to present the material is to create a book of research pages generated by different groups.

4) Students share their research using the original two lists, and drawing lines from the 'needs' to the 'resources'. Each item will have several lines drawn from it, connecting it to the natural resources from which it is made.

Evaluation:

Discuss the web-like image that evolves using the following questions:

What would happen if a part of the web, for example, a particular animal, was unavailable for use? How would this affect the other parts of the diagram?

Think of how some of these resources are used today. Do we depend on natural resources more, less, or the same as early people did? How is this use different?

Indians relied on the rich diversity of resources found on wild lands. However extinction and threats of extinction to plants and animals were not usually a problem. Today they are. What are the reasons for this difference? (*Greater population harvesting the resources at a more rapid rate. Also loss of habitat and reduction of biodiversity.)*

Credit: Adapted from *Teaching For Wilderness* by Wendy Scherrer, North Cascades Institute, 1991.

Activity 2: Making A Homestead

Background:

Emphasize the multi cultural character of early western communities and the roles that cultural groups played: Irish, Chinese, Jewish, Hispanic, Italian, French, Native Americans, etc.

Materials: Books of early history w/photos & written accounts

Procedure: 1) Briefly introduce the Homestead Act of 1862 in which President Lincoln made 160 acres available to every family willing to work the land.

2) Present the following scenario, or create your own:

"Your family has been traveling for two months in a covered wagon from the east coast. Finally you arrive in the region that is now the state of New Mexico. You can see high mountains in the distance and know your family plans to homestead at the base of these mountains. You have brought the following items with you":

1 large bag of corn seeds
1 small bag of salt
horse drawn plow
kitchen pots & pans
shot gun
fire starter
milk cow
horse & mule
small bag of vegetable seeds
fish hooks
1 large bag of wheat
1 bag of flour
tools
sewing supplies & some cloth
knife
small stove
chickens
2 pigs
axe
1 small bag of sugar

"Your family selects a site at the mouth of a small canyon where there is a water supply and a dense forest. Deer, elk, bear, wolf, bobcat, grouse, and other game inhabit the area."

3) Divide students into family groups. Each group should make a list of the things 'to do' in order to make their home in this wilderness. Next students should identify and number their priorities, what they will do first, second, etc.

4) Students then write a brief description of how they will achieve these items on their 'to do' list. For example, "Build a house" would involve cutting trees and clearing land.

5) Have students examine their lists and circle every action that involves use of resources. After the lists are complete discuss:

- As a settler, what feelings did you have about wilderness? fear? frustration? respect? admiration?
- Can you imagine any conflicts between your domestic animals and wild animals.
- Was it harder or easier to make a living here than where your settler family came from? Why?
- Would you have thought your actions were harming the land? the wildlife populations? the water resources?
- Are these attitudes about wilderness and resource use similar to or different than your own?
- Today, building a home in a federally designated Wilderness area is illegal, though Wildernesses may include sites of old homesteads, cabins, or barns constructed before this designation. If you were writing a management manual for how to manage these structures, what would you recommend? Why should or shouldn't they be renovated, destroyed, or left alone?

Activity 3: Wilderness: A Flannel Board Story

Materials: **Story script**

Flannel with Wilderness areas of the U.S.

Laminated picture cards students

Laminated Quote cards

Procedure: 1) Begin by handing out pictures of houses, mountain men, farms, etc. Tell students, "When you hear the part of the story that relates to your picture, please come add it to the flannel board. As you add a picture, you can take one down and leave it at the bottom of the map."

2) Read or tell the wilderness story. Teacher says:

"Long ago, this country was completely wilderness...a place where Mother Nature was in charge. The land was inhabited by many different kinds of animals and Native Americans who respectfully lived in harmony with nature. Indians travelled quietly and carefully, leaving little evidence of their trails and campsites. As the country was developed, people settled along the east coast...changing the landscape by sowing crops and building houses."

Ask students with houses to put them on east coast, removing trees to substitute with the houses. (You may have to prompt this.)

3) Continue the story:

As people moved west, these settlers viewed wilderness as a dangerous place to conquer. Mountain men came to explore this country, to trap beaver, hunt buffalo and to pass on the knowledge to people in the East.

People spread out to all parts of the country...Settlers cleared the land, farmed some of it, built towns and rail lines and roads. The elk, deer, wolf, bear, and buffalo lost more and more of their habitat.

Take more of the trees and animals down, if necessary. Ask five volunteers to read statements of important historians. Give each person a quote to read when it is their turn.

4) Continue story: You say:

In the early and mid-1800's some people began to notice the loss of wild country.

Now ask volunteers to read cards, representing important historians...

"I'm James Audubon. I study birds and I am finding that we are losing lots of forest habitat that is important to the birds and other animals."

"I'm George Catlin, I study and paint pictures of American Indians. I'm very worried about the disappearance of American Indians, buffalo, and the wilderness that is their home."

"I'm Chief Seattle. You must teach your children that the ground beneath their feet is the ashes of our grandfathers. So that they will respect the land, tell your children that the earth is rich with the lives of our kin. Teach your children what we have taught our children—that the earth is our mother. Whatever befalls the earth, befalls the sons of the earth. The earth does not belong to man; man belongs to the earth. All things are connected.;

You say:

"Writers like Henry David Thoreau, John Muir, Arthur Carhart, Aldo Leopold and Rachel Carson also became concerned and made others aware of the value of wildlands. They felt that wilderness was a source of inspiration and strength.

Ask volunteers who have quote cards for Thoreau, Muir, Carhart, Leopold and Carson to read cards out loud.

"I'm Thoreau. In wildness is the preservation of the world."

"I'm John Muir. Wilderness is a necessity...a fountain of life. Thousands of tired, over-civilized people are beginning to find out that going to the mountains is going home; that wildness is a necessity: that mountain parks and reservations are useful not only as fountains of timber and rivers, but as fountains of life."

"I'm Arthur Carhart. I think there is a limit to the number of lakes in existence and to the mountainous areas of the world. I think that because there is a limit to God-made natural scenic beauty,these areas should be preserved for all people to enjoy."

"I'm Aldo Leopold. I am interested in preserving wilderness for wildlife, but I am also understanding the importance of wilderness for humans. I think it is important for future generations to have opportunities to experience wild lands just as the early pioneers did."

"I'm Rachel Carson. It is a wholesome and necessary thing for us to turn again to the earth and in the contemplation of her beauties to know the sense of wonder and humility."

5. You continue story:

"Eventually some of these people and others demanded that the government preserve areas of land as Wilderness. They got together and said, "Hey! If we're not careful, there will be no more wildlands where we can see what this country looked like long ago." They worked together to pass a law called The Wilderness Act...it took 8 years for Congress to agree on the law, and it was finally passed in 1964...more than 30 years ago!"

6. Now take everything off of the map...it will show the existing Wilderness in the country.

You say:

"This map shows what part of the country is now designated Wilderness. What percentage is it?"

Answer: 1.8% of lower 48 states; 3.5 % if Alaska is included.

7. Now complete the wilderness story:

Here's how the Wilderness Act defines wilderness: "A wilderness, in contrast with those areas where man and his own works dominate the landscape, is recognized as an area where the earth and community of life are untrammeled (or uncontrolled) by man, where man himself is a visitor who does not remain."

Extensions:

- Appropriate activities in wilderness:

(Make sure all of the pictures are down.)

The Wilderness Act says the "imprint of man's work" must be "unnoticeable" in Wilderness. That's a BIG job -- to visit an area and to make it look like you haven't been there. To keep the WILD in Wilderness, cetain things are not allowed ---

structures and roads
motorized equipment
motorized and mechanized transport.

(Pass out pictures of activities allowed/not allowed in wilderness)

Now, remembering that a Wilderness is a natural place, where people are only visitors. What are some activities that are NOT appropriate in Wilderness? Put those activities outside of the map.

What are some activities that ARE appropriate in Wilderness? Put these on or near Wildernesses on the map.

NOTE: This is a great opportunity for kids to use critical thinking skills, deciding on their own what is appropriate. After they are finished putting their pictures on the map, go through each one and validate if it's correct. Good time to discuss bicycles.

The best way to be a good visitor in Wilderness or any place is to **LEAVE NO TRACE** of your visit.

These lands are your lands whether you live in Boston, Massachusetts or (their town & state). The Forest Service and other government agencies manage Wildernesses and make important decisions about the land. But they can't do it alone. They need your help, too. You can help with these decisions. You can help keep it wild. If you visit Wilderness or any public lands, practice LEAVE NO TRACE camping so the people who visit after you've left can feel like the first explorers. The Wilderness challenge of years ago was to survive and conquer the wildlands. The Wilderness challenge today is to see if the Wilderness can survive the impacts of people. Teach your friends and family about keeping the WILD in Wilderness. Learn to listen and learn to look...see what you can discover.

Credit: Sally Blevins, Region 1 Wilderness Education Coordinator

- Contact a tribal office for persons interested in visiting your classroom to discuss traditional uses of natural resources.
- Have students interview an older friend or family member about their family origins and the events that brought them to a western state.
- Bring in old photos & historical writings about the development of your community.
- Visit an historical museum.

Evaluation:

Evaluate completed lists and written description of how families would get settled.

Ask students to write an essay, assuming and describing the role of a pioneer.

Students will illustrate or write a brief description of how current day resource use is alike or different than historical use, and how this relates to Wilderness.

Discuss current wildernesses (no permanent structures or homes, different philosophy and concept).

Credit: Adapted from ***Project Learning Tree Grades 7-12***

> *"Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life: he is merely a strand in it. Whatever he does to the web, he does to himself..."*
>
> *—conceptual origin attributed to a speech by Chief Seattle*

Lesson 2: Wilderness Act History

Objective:

- Students will list important events in the environmental preservation movement and when they occurred in relation to dates of personal or historical significance.

Background:

In response to the increasing development of the West addressed in Lesson 1, several individuals became concerned all land would be developed, with no land left uninhabited or in its natural condition. The activity provides more specific information about the Wilderness Act, in the form of information and a game included in *The Green Scene.* Please refer to the Middle School section for further activities concerning historical perspectives.

See Also:

- Where Is Wilderness?—(Middle-Overview), Page 215
- Personalities and Philosophies in Wilderness Preservation—(Middle-Perspectives), Page 253

Activity: Citizen Action: The Wilderness Act

Materials: ***The Green Scene "Citizen Action: The Wilderness Act"***

Wilderness Management Philosophy in the Rocky Mountain Region

Procedure: (Substitute appropriate philosophy for your area.) 1) Review concepts of lesson one. Ask students why they think there were people in U.S. history who wanted to create an Act that would set aside lands to be left undeveloped. It might be interesting to put the following population figures on the board:

Population of your state in: 1860 __________
1890 __________
1993 __________

2) Begin with the information covered in the 'Why?' section of this *Green Scene* lesson, described in *"Citizen Action"* part one. Conclude with part two, or suggest that students write a 'Wilderness Act' that will protect an area of their school ground or community.

Extensions:

- Compare & contrast the perspectives of wild places addressed in the activities of this strand, from subsistence, to use, to preservation. How do these fit with the attitudes students have about wilderness?

> *...it is...the policy of the Congress to secure for the American people of present and future generations the benefit of an enduring resource of Wilderness.*
>
> *-The Wilderness Act*

ECOLOGY

Lesson 1: Adaptations & Habitats

Objectives:

- Students will understand adaptations as specific survival mechanisms contributing to species diversity.
- Students will recognize the associations between adaptations and habitats.
- Students will understand if habitat is reduced or changed, species diversity will be reduced.

Background:

These activities focus on adaptation, which is a genetic behavior or physical characteristic that is environmentally determined. ***Living Treasure: Saving Earth's Biodiversity*** *provides excellent background for the connections between adaptations, habitats, and the preservation of biodiversity. The definition of 'biodiversity' is in the glossary. Before beginning the activities read through the "Adaptations & Habitats" student/teacher worksheet found at the end of this lesson (Page 137), to review or introduce these concepts.*

Activity 1 uses the diversity of bird bills and a variety of food sources to show feeding adaptations. Activity 2 is an art and writing exercise in which students design imaginary animals to survive in a variety of habitats with diverse environmental factors. In Activity 3 students connect specific adaptations with particular habitats or community features. Activity 4 is a research project involving threatened and endangered species.

These activities are sequenced from those involving general concepts through imaginative and creative activities, to those focusing on specific information requiring analytical and research skills. Thus, we recommend that teachers read through the entire lesson, before beginning with the first activity.

See Also:

- Habitadaptations—(Primary-Ecology), Page 65

Activity 1: Birds & Bills Game

Materials: **Bird Book**

Bill Types

chopsticks or toothpicks for 1/5 of class to each have 2
spoons for 1/5 of class
tweezers or forceps for 1/5 of class
straws for 1/5 of class
nut crackers or pliers for 1/5 of class
cup or small bag for each student

Food Sources
popcorn and/or Cheerios
several small glasses water or juice
whole nuts or seeds with hard coverings
rice

pretzel sticks (or fake worms!)
nails, washers, misc. tool items may also be used for a non-edible activity, in which case it is interesting to add a magnet to selection of bill types.

Procedure:

1) Ask students to think of birds they have seen, how they were feeding and what they might have been eating.

2) Lead students in a discussion that many birds have bills adapted for specific food sources. For instance, with its sharp hooked bill, a hawk would have little success feeding on water plants like a duck. Similarly, the flattened bill of a duck would be poorly adapted to capture and consume small mammals, like a hawk. Use the **bird book** to show pictures.

3) The following feeding adaptations will be demonstrated in this activity:

- Hummingbirds whose long thin beaks (straws) can reach into flowers for nectar (cups of water or juice).
- Sparrows, finches, and grosbeaks with short, stout beaks (pliers or nutcrackers) that can break open the hard coverings of some seeds (whole nuts).
- Swifts & swallows whose large mouths (spoons) scoop up insects as they fly (popcorn or Cheerios).
- Warblers with tiny pointed bills (tweezers) pluck insects (rice) from the leaves and bark of trees.
- Many shorebirds have long thin bills (chopsticks or toothpicks) used to probe mud or sand for worms or small crustaceans (pretzels or fake worms).

The symbolic bill types and foods are included here in parentheses for your reference, however students may experiment with using their bill to gather any of the food types. (Please refer to **Familiar Birds of North America** *for more information and photographs of these birds.)*

4) Distribute the food sources in the designated area. You may wish to place particular food items together to represent specific habitats where these food sources are found.

5) Distribute bill types to class members as described in the procedures.

6) Before you begin the feeding time, discuss the following "table manners".

- Students are NOT to consume food until end of activity, except for the liquid food sources that may be drunk during the collecting time.
- Tools other than straws may be used only once in liquids.
- As they collect items students may save them in a bag, or cup.
- To collect a nut, your bill type/tool must be able to crack it open to utilize the food source inside the shell.

7) When all food has been collected regroup and compare collections obtained with different bill types. Experiment and try another bill. Which bill works best with which food type? Try some of the following:

BEST COPY AVAILABLE

- Graph or record amount of each food taken by each bill type.
- Make a graph of bill types to number of different foods taken. This may demonstrate the difference between specialists that can only feed on specific foods in contrast to generalists that utilize a variety of food sources.
- Remove one food source and repeat the activity observing results. Discuss phenomena that could cause this situation. For example, if fish are killed by pollution or particular plants decimated, or habitat is lost through development, birds that specialize in these foods will leave an area or be reduced to such numbers that they may become endangered. Conversely, discuss ways to improve habitat with water and a diversity of vegetation.
- Explain biodiversity as the number of different species of plants, animals, organisms, different types of ecosystems,which includes genetic diversity and population diversity in an area. Repeat the same activity with only two different food sources. Note the effect on the food acquired by different bill types. Discuss how this loss of diversity in terms of food sources could affect birds and other interdependent organisms.
- Distribute food as before, and use string to divide the area into three or four sections. Explain that these represent barriers to movement, and students from one section will not be able to cross into another to feed. How does this affect the amount of food acquired by different bill types? By individual birds? This represents the fragmentation or separation of habitat components. The barriers to travel created by fences, roads, highways, or urban development can reduce the availability of resources to species that live in the area.

8) Ask students what is the role of wilderness in preserving large tracts of undisturbed habitat and the importance of this in preserving diversity of species as well as insuring that individual species will meet their habitat needs in these places. Why is Wilderness important? Lands left undisturbed by human manipulation provide opportunites for natural adaptation to continue.

Credit: This activity is used in a variety of environmental education programs. For a more extensive description, refer to Ranger Rick's **Nature Scope "Birds, Birds, Birds!"**

Activity 2: Wacky Adaptations

Materials: Paper (1 large piece/student if done individually
1 very large piece /group if done in small groups)
Drawing materials (pens, markers, etc.)

Background:

Review the background information about basic needs of animals. Explain that just as animals are adapted for particular feeding habits, they are also adapted for survival in particular environments with a variety of abiotic factors. Discuss examples of how an animal that lives in a cold habitat has different adaptations than one that lives in a hot environment.

Procedure:

1) Present the following scenario: Students are to create an animal that has never been discovered. Their particular animal is found only in wild and remote places. They are to design a plant or animal that is adapted to meet it's needs under particular environmental factors. For animals they must describe their height and weight, fur or feathers, food, and social habits as outlined in the Data Sheet on Page 139. Remind students that these animals may have incredible features. However as they are found in remote wilderness areas, they may not be mechanized.

2) Distribute large paper, drawing materials, and data sheets. Assign or have students select from the following, or create your own descriptions:

Hot & dry
Bottom of ocean
Hot & wet
Hot & acidic
Moving freshwater
Cold & windy
Cold & icy
Warm & swampy

3) Students present their animals to the class. In preparation for this you may wish to use the Wacky Adaptations Data Sheet, included at the end of this lesson. If your class is interested in competitions, give 'awards' for species that are most creative, most likely to succeed, best looking, best ideas, etc.

4) Review the importance of providing appropriate habitat for species adapted to meet their needs in these environments.

- Switch environment cards between species. Would they survive if their habitat changed in this way?
- Are there wild animals similar to those you created? Where do they live? What would threaten their existence? What would help them survive?

Activity 3: Adaptations Game

Materials: Index cards

Student-Teacher Worksheet (end of lesson on Page 137)

Procedure:

1) Copy the following list of adaptations below, one each, onto index cards.

2) Discuss the student/teacher information sheet with students included at the end of this lesson. Together create a definition of adaptations. Emphasize that whether or not adaptations are viewed as the result of dramatic genetic mutations, or slow change over time, they are all closely connected to the habitat in which species live.

3) Present the adaptation cards and discuss what each one means.

4) Have the group divide into at least two teams. Spread out cards on a table in front of the class. One or two members at a time are designated to represent their team for each challenge. Those students stand next to the table within equal proximity of the cards.

5) Read a habitat/community feature listed below and allow team representatives 10-15 seconds to collect adaptation cards that describe adaptations you might expect to find in plants or animals meeting their survival needs in this community or habitat type.

6) Have students explain why they selected their cards. For each correct description. You may wish to designate a panel of judges, or to allow other team members to contribute to these explanations.

Adaptation Cards

Hibernate
Thick Fur
Fly South
Migrate North
Migrate to Lower Elevation
Migrate South
Migrate to Higher Elevation
Store Food Within Body Cells
Store Food in Caches
Lay Lots of Eggs
Lay Camouflaged Eggs
Male & Female Feed on Different Foods
Feed at Night
Good Night Vision
Camouflaged Body
Strong Grinding Teeth
Long Legs for Speed
Predator Hunts in Packs
Webbed Feet
Light Weight Body With Hollow Bones
Long Sticky Tongue

Community Interactions & Habitat Features

Cold Temperatures

Hot Temperatures

Strong Winds

Limited Water Supply

Seasonal Food Source

Predator Eats Eggs

Lives in Water

Food Source is Nocturnal

Food Source is Insects

Able to Fly

Prey Species Lives in Herds

Food Source is Plants

7) You might wish to conclude by having students choose adaptations to illustrate and/or write about. These cards could also be used for a game of "adaptations charades" in which students draw cards and act out the adaptations.

Credit: Credit for the idea of this game is given to Pete McGee, field director for the Yosemite Institute, 1985.

Activity 4: Endangered Species

Materials: ***Last Bit Bear***

The Lorax

State Wildlife Reference books

Procedure: 1) Using the familiarity with concepts of adaptation, habitat, and biodiversity discussed in the previous activities, students research individual species that are endangered or threatened in their state and identify their connection to wilderness. You may wish to use the same questions included on the Endangered Species Data Sheet to structure this activity, or to assign a particular format for presentation.

2) The following list of species have held threatened or endangered status in Colorado within the past 10 years (please modify this list for your specific state).

Grizzly Bear
River Otter
Wolverine
Piping Plover
Plains Sharp-tailed Grouse
Wood Frog
Greenback Cuthroat Trout
Red-Cockaded Woodpecker
California Condor
Black-footed Ferret
Whooping Crane
Peregrine Falcon
Sandhill Crane
Least Tern
Colorado Squawfish
Razorback Sucker
Arkansas Darker
Gray Wolf
Lynx
Bald Eagle
Lesser Prairie-chicken
Greater Prairie-chicken
Humpback Chub
Bonytail
Manatee

3) Encourage students to consider the aesthetic, ecological, and economic aspects of these species.

What is their "value" in these terms?

Should areas be preserved specifically for endangered species?

In what ways do these species reflect the health of their habitat, or entire ecosystem?

How many depend on wild lands and rivers?

Wildlife in Danger, a publication by The Colorado Division of Wildlife, and its associated video, are excellent references for this information.

Peregrine Falcons, The Path to Recovery (Teacher Resource Packet, Colorado Division of Wildlife) is another excellent resource.

4) Conclude, or introduce this activity with ***The Last Bit Bear*** and/or ***The Lorax***, books that creatively and symbolically address loss of biodiversity and associated species.

Extension:

- From **Project Wild**,conduct the following activities: "Habitat Lap Sit," "Shrinking Habitat," "Carrying Capacity," and "Habitat Rummy."

> *"The only thing we know for sure about the future is that it will be radically different from the past. In face of this enormous uncertainty, the least we can do for future generations is to pass on as many of the planet's resources as possible..."*
>
> *—Norman Myers, Author of The Sinking Ark*

ADAPTATIONS AND HABITATS

All living things must meet basic needs to successfully survive in their environment. These include food, water, and covering or shelter.The 'tools,' 'clothing,' or habits animals use to meet these needs are their adaptations. In definition, adaptations are genetically determined (inherited) characteristics of behavior, form, or physiology that improve a plant's or animal's ability to survive within it's environment.

It is important to distinguish between physical adaptations and learned behaviors. For example, our thumbs are opposable and can touch each of our fingers, a useful physical adaptation for holding things. Playing the piano with our hands is a learned behavior. Just because our parents may be able to play the piano, we do not inherit the ability and must learn to do so.

Some examples of different types of adaptations are as follows: Migrating from southern to northern climates is a ***behavioral*** adaptation used by many bird species to utilize resource-rich summer nesting, and avoid climatic stresses of these same environments in the winter. The long slender bill of a hummingbird is an adaptation **of form** specifically for feeding on the nectar of tubular flowers. The hibernation of ground squirrels throughout the winter requires many ***physiological*** adaptations to continue life processes at low levels during these months.

Adaptations may be thought of in general terms, and often describe characteristics of large groups of plants or animals, such as the feathers of birds or the fur of mammals, both of which function at least partially as insulating adaptations. Adaptations may be as specific as the tiny protrusions on one digit of the foot of a heron that serve as a minute comb in preening. Also, different genders within the same species may exhibit different adaptations. The brilliant courtship feathers of male waterfowl contrast with the more easily camouflaged nesting colors of females within the same species.

The connection between adaptations and habitat is strong. Some adaptations are so specific that animals cannot survive in habitats without the food, water, shelter, they are adapted for obtaining. For example, black-footed ferrets are finely adapted for hunting prairie dogs and living in prairie dog burrows. Species such as these are often considered 'specialists' and may be those most easily prone to extinction. Other species, like grizzly bears, though they are not specialists in terms of food habits, have large habitat requirements as they search for a variety of foods during different seasons, and require specific denning conditions within their winter habitat. Wilderness management seeks to maintain habitats and communities to preserve the species adapted to live in these environments.

Discussion Questions:

- What are some things all plants and animals need to survive? Think of an animal you are familiar with and describe the way it meets these needs.
- What adaptations do you have? What are some learned behaviors?
- What are some behavioral adaptations you have observed in animals?

ECOLOGY - ELEMENTARY - STUDENT/TEACHER WORKSHEET #1

The prickles of a cactus are an example of an adaptation of form. How does this help the plant to survive? (These modified leaves with a small surface area reduce the loss of moisture through them in hot, dry habitats. They also provide excellent protection from predation!)

Can you think of other examples of how the form of a plant or animal helps them survive?

What are some general adaptations that all mammals have?

What about other groups of plants or animals?

Can you think of some adaptations that meet the same needs in different groups?

WORKSHEET #2 - ELEMENTARY - ECOLOGY

WACKY ADAPTATIONS DATA SHEET

Student Designers:

____

Environment: ____

Name of species: ______________________________________

What does your species eat? Does it eat lots of different things, or only a few special foods?

How does your animal find food and water? If your species is a plant, how does it get the sunlight, water, and nutrients it needs?

How does your species keep from getting too warm or too cold?

If your animal makes a shelter, what is it like? If your species is a plant, how does it survive in these environmental conditions?

Describe some of your plant or animal's special adaptations.

Does your plant /animal live alone or in groups?

How does it protect itself against predators?

ENDANGERED SPECIES WORKSHEET

Researcher(s): ______________________________

Name of species: ______________________________

Where does your animal live? What is its habitat like?

In general, what space does your animal require? Could it meet all its needs in a natural area the size of your backyard? A city park? 10 square miles? On the back of this paper, draw a diagram of an area in which your animal could live. Include all the things it would need to survive and an estimate of the size of its territory.

What does your animal eat?

How does your animal find food and water?

If your animal makes a shelter, what is it like?

Describe some of your animal's special adaptations.

Does your animal live alone or in groups?

Who are their predators? How does your animal protect itself against predators? If it is a predator, what might cause it injury or death?

Which of the above adaptations has become a problem for your animal as its habitat has changed?

Why is your animal endangered?

Lesson 2: Community Connections

Objectives:

- Students will give two examples of specifically adapted plants and animals that fill certain interdependent niches in an ecological community.
- Students will identify the roles of at least four different species within a sample food web.
- Students will be able to describe one way in which wilderness preservation helps to sustain community interactions between wild species.

Background:

Wildernesses preserve not only large tracts of land, but also interactions between the plants and animals that inhabit these places. Together these species compose natural communities whose connections may be predatory, parasitic, or symbiotic. These relationships may not be evidenced until they are altered. For example, the demise of a predator may lead to overpopulation of a prey species, resulting in degradation of the plant community that supports this species.

A general outline of the role played by different organisms in a community is covered in Activity 1, followed by more specific examples of carnivores and herbivores as students examine mammal skulls in Activity 2. Activity 3 creates a food web further demonstrating these interactions.

For a brief synopsis of three different models often used in describing community interactions, refer to the ***"Community Models"*** *student/teacher information sheet included at the end of this lesson (Page 145). The field guides may also be helpful in providing information about different species.*

See Also:

- Words from the Lorax—(Elementary-Connections), Page 155
- Ecosystems—(Middle-Ecology), Page 277
- Fire's Role in Wilderness—(Middle-Ecology), Page 279

Activity 1: Community Strength: Chains & Pyramids

Materials: At least one of the following: notecards, wooden blocks, or enough kids of just the right size combination to safely build a human pyramid(!).

Procedure: 1) Ask students what they do when they need energy? When they are hungry, can they stand in the sun and feed themselves? Where does our food come from? Establish definitions for producers, consumers, and decomposers. Discuss the path of energy from the sun to plants to animals.

2) Following are some suggestions for sharing information about community food chains:

- Brainstorm some simple food chains and record them on the board.
- Have students assume different parts of a chain and organize themselves into actual chains by linking arms. Have each student share what the process is that connects them with the next link in the chain. With the group generate scenarios that might weaken the chain.
- For younger students, write these community components on strips of paper that may then be looped together making actual paper chains of

community members.

3) Explain that each time energy passes from one organism to another, some of it is lost in the transfer, so that not as much is available for the next recipient. For example, small trees, shrubs, and bushes are an abundant food source for mule deer (bottom layer of the pyramid). A deer population of several hundred (Middle layer of the pyramid), may support 10-20 mountain lions (top layer of the pyramid).

Seed
v
Plant
v
Rabbit
v
Mountain Lion
v
People

4) Discuss and/or demonstrate the adjacent pyramidal structure of communities in the following ways:

- Use notecards of different colors representing different trophic levels with appropriate examples of different species at each level.
- Replace notecards with blocks and note what happens when one piece is removed.
- If you have the right combination of students and courage (!), assign students different species within the pyramid, and have them create a human pyramid.

5) Observe and discuss what happens to the pyramid when any one of the layers is removed or reduced.

What are some ways natural populations might change so that the "pyramid" remains stable? For example, if the food source is reduced, fewer of the species in the layers above will survive, or they will migrate to new areas.

Note: *Some pollutants are passed through the pyramid. DDT was once used to kill insects. Small birds then ingest these pesticides and they are passed on to peregrine falcons that feed on the birds. In the falcons, DDT results in the production of thin egg shells causing them to break before they hatch. This is another way that one part of the community model responds to actions at a different level. This also shows the connection between wilderness and urban areas and how our lifestyles affect the preservation of wilderness.*

6) In conclusion, discuss ways human actions can help to preserve these community connections.

Activity 2: Community Web

Materials:

Notecards and/or pictures of plants, animals, environmental factors

Butcher paper or cardboard for mural

Wildlife postcard collection

Local Wildlife Poster

Procedure:

1) Ask each student to select a plant or animal, within the poster that interests them, or have students select a plant or animal that could live in a particular community such as a pond or forest.

2) Each student collects information from the library or resource books about their species focusing on the following questions:

Where does the species live? What is its habitat like?
What does it need to survive? How does it affect its environment?
What does it eat? How much/often does it feed?
What shelter does it require? Where does it make it's 'home'?
Where does it get it's water?
What animals feed on it?
What other species does it live with?

3) Have students illustrate or locate pictures of their species in artwork or magazines.

4) On the cardboard or butcher paper create a mural of the natural features of the community, including trees, land forms, and water sources.

5) When the mural is finished, students attach pictures of their species to appropriate habitats and explain why they chose these locations, based on the information they have gathered.

6) When they are all in place discuss the "web of life" concept, as "who eats who", and suggest that as in a web, all living things are connected.

7) Using different colors of yarn for each species, connect them to other components of their community with which they " interact" (for example, eat, are eaten by, need for habitat). Students can act as experts for their species.

8) Upon completion you will have a web of life for this community. Attach or place student reports nearby and share your mural with other classes or parents.

9) Discuss how communities relate to wilderness.

Extensions:

- Related ***Project Wild*** activities are "Oh Deer", "The Thicket Game", "How Many Bears Can Live in This Forest?", "Environmental Barometer." From ***Project Learning Tree*** check out "A Field, A Forest, A Stream."

Evaluation:

Have students illustrate their own food web, chain or pyramid of at least four wild animals. Then ask them to focus on one connection and describe how Wilderness designations of the area in which this community lives would help to insure these interactions.

> *A Wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man...*
>
> *- The Wilderness Act*

COMMUNITY MODELS

Plants and animals live and interact together as a community in specific areas. Each member has a particular 'job'. Through photosynthesis plants convert the sun's energy to food energy and are thus considered *producers*. Animals are *consumers* of this food energy as they feed directly on plants, or on plant eating animals. *Decomposers* break down dead plants and animals, returning them to the nutrient cycle.

The study of these interactions and cycles is called *ecology*. From simple chains, to complex webs, to computer modeling environmental educators and ecologists alike have created a variety of models to represent the interconnections between living organisms and their environment.

The symbol of a chain is often used to represent the links between the plants, the animals that feed on them (*herbivores*), and the animals that feed upon other animals (*carnivores*) like so:

seeds+ mouse+weasel+ hawk
shrubs+ deer+ mountain lion
algae+ aquatic insects+ trout+ otter
seeds+ ground squirrel+ bear
grass+rabbit+owl

Like a chain when one link is broken or removed by the reduction or demise of that species the entire chain is weakened.

To represent this transference of energy in a more quantitative manner, a pyramid of different *trophic levels* is often used. As one level is utilized by the organisms above it, there is less available energy for the next. All the energy put into a mouse by the consumption of seeds, is not transferred to the weasel that feeds on it. Some parts will be less digestible and yield less food energy. Appropriately then, it takes more than one mouse to meet the food needs of a weasel as represented in this pyramid.

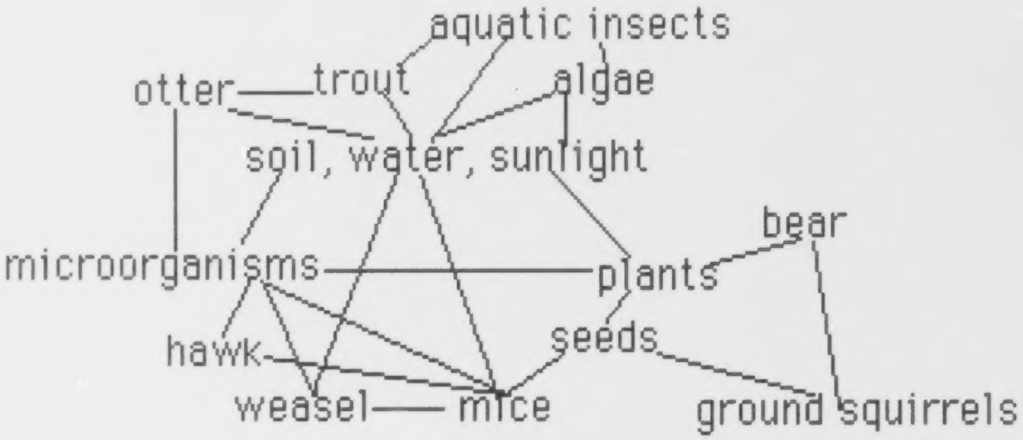
hawk
weasel weasel
mouse mouse mouse
seeds seeds seeds seeds

For more details about this model, please refer to an ecology or life sciences text.

Without decomposers, including scavengers, fungi, microorganisms and other species, as living organisms in both of these models died, the build up of organic materials would be incredible! Noting the role of decomposers in breaking down non living materials, a chain might be converted to a cycle:

soil, water, sunlight
decompose *provide nutrients and energy*
microorganisms plants
dies *produce*
hawk seeds
fed on by *fed on by*
weasel mice
fed on by

A fourth model of community interactions is often described as a web as it further depicts the connecting strands between diverse members of a community. For instance, the seeds fed upon by the mice are also food for the ground squirrels that are one of the food sources of the bear.


aquatic insects
otter
trout
algae
soil, water, sunlight
bear
microorganisms
plants
seeds
hawk
weasel
mice
ground squirrels

The intricacies and importance of the connections represented in these models are often recognized only when many parts of a community have been negatively influenced by their loss. Wilderness lands help preserve community interactions that are easily observed, as well as those yet to be discovered.

Lesson 3: Introduction to Skulls

Objective:

- Students will correlate skull characteristics with feeding habits and identify the different roles of these mammals within a community.
- Students will be able to identify three different skulls as carnivores, herbivores, or omnivores and will define these terms.

Background:

Skulls are used as a means of providing hands on examples of the concepts covered in Lesson 2. They are also used to promote reasoning and observation skills, as students examine and learn about the characteristics of different skulls. In preparation for this lesson, or with your students, please refer to the student/teacher information sheet "Stories From A Skull" (Page 149).

This activity capitalizes on the childrens' curiosity for skulls. The information and worksheets focus on skull features as well as the larger picture of how these animals fit into a natural community. There are a variety of formats you may wish to use to convey these concepts. Following is a suggested sequence.

Materials:

Skulls
student/teacher information sheets
skulls worksheets one and two
Local Mammal Field Guide
Resource books about wildlife

Procedure:

1) Introduce skulls as scientific specimens used to promote learning about how some animals live and interact in wild communities. Explain that skulls are difficult & costly to replace and each year several hundred students may be handling them.

2) To encourage problem solving and investigative skills, divide students into small groups and give each group a skull. Here emphasis is on observation, not on identification. Use the following guiding questions:

Do you think this animal eats plants or meat or both?

Where might it live?

What is the most interesting feature?

Where are the eyes?

3) Have small groups report observations and details that led to their conclusions.

4) Read and/or share information covered in 'Stories From a Skull' student/teacher information sheets, referring to actual skulls as well as noting features on yourself. The vocabulary list is included for you to insure that students have knowledge of these terms. Discuss or assign students to look up words, as appropriate for the knowledge of your group.

5) Complete Worksheet #1 (Page 151) by labeling different parts of the skull that you list on the board, being those used in the information sheet. Complete Worksheet #2 (Page 152) by matching the mammals with their skulls. The field guide is an excellent reference for this. Instead of the worksheets you might wish to make an alternate assignment that involves labeling their own skull illustration, or identifying these skulls in another way.

See Also:

- What Is Wild?—(Primary-Ecology), Page 61
- Creative Movement for Wildlife Species—(Primary-Ecology), Page 73
- Stories From a Skull—(Middle-Ecology), Page 265

Extensions:

- To extend your study of skulls into other subject areas, you might do the following: Make clay sculptures of skulls.
- Create pen & ink illustrations of skulls.
- Refer to Georgia O'Keefe artwork.
- Measure skulls.
- Imagine a skull was found in a wild place and write a field entry about it because you are going to leave it behind.
- Write a story about what a skull would say if it could talk.
- Blind fold students to examine skulls and determine their identity or adaptive features.

We need another and a wiser...concept of animals... For the animals shall not be measured by man. In a world older and more complete than ours they move finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear.

—Henry Beston,
The Outermost House

STORIES FROM A SKULL

Studying a skull is like trying to figure out a whole story from just a few pieces of information. Observing a skull, we can learn about ways the animal is ***adapted*** to survive in its ***environment,*** and its place in a ***natural community.***

The skulls in this collection come from ***mammals.*** Although the teeth, sizes, and shapes of the skulls are different, all mammal skulls have two parts. As mammals, you can note these parts on yourself. The ***cranium*** or skull proper, is the top part of your head. The ***mandible*** or jawbone, the lower part of your skull. When you put your fingers in front of your ear, and open and close your mouth, you can feel the joint where the cranium connects to the mandible

The different shapes and combinations of teeth in different ***species*** can be used to learn more about the animal's feeding habits. It is helpful to learn some names for types of teeth. Using humans as an example of an ***omnivore,*** you can locate them in your own mouth. Begin with the middle 4 teeth in the front on the top and bottom. These are ***incisors.*** Moving back, are the single ***canines,*** or teeth that would be longer and more pointed if identified in the mouth of a ***carnivore.*** Behind them are the flattened ***premolars*** and ***molars.*** When you bite an apple, you use your incisors and canines. When you chew it, you use your molars and premolars.

Carnivores have a mouth adapted for eating meat. They have snipping teeth (incisors), longer tearing teeth (canines) and somewhat pointy grinding teeth (premolars & molars). Look at a carnivore skull, and also notice how the teeth fit together. You can demonstrate this by putting your hands together so that the fingers of one hand fit between the fingers of your other hand. This is the way a carnivore's teeth fit together, as upper and lower teeth mesh.

Looking at ***herbivore*** skulls, there are two main types which are those of ***ungulates,*** and those of ***rodents.*** Within the ungulate group, members of the deer family (cervidae), do not have upper incisors. Instead, they have a bony ridge used like scissors by rubbing their tongue against it when snipping or browsing on shrubs. Rodents, have upper incisors that grow continuously to replace the ends of the teeth worn down by gnawing on rough materials. (Imagine if our teeth grew like this, we would have to file them down every morning!) The front side of these incisors is strong enamel and the back side is softer dentin. If you have a gerbil, mouse, or guinea pig in your classroom, carefully look for these teeth as they chew.

The location of an animals eyes may indicate whether it is usually a ***predator*** or a ***prey*** species. Predators, like coyotes have eye sockets that face forward for better focus on animals they are hunting. Prey animals, like antelope or ground squirrels, often have eye sockets located more to the sides of their skull. Carefully feel around your eyes for the bones that form your eye socket. You can check the scope of your vision by holding your fingers in front of you then moving them to the side with your arms straight. Keep your head facing forward, and notice there is a point where you can no longer see your fingers. Eyes and nostrils on top of the skull may indicate that an animal spends much of it's life in the water, like beavers and muskrats.

ECOLOGY - ELEMENTARY - STUDENT/TEACHER INFORMATION

The length of a mammal's nose, or rostrum, is somewhat related to how much it depends upon its sense of smell. For example, a coyote's nose has about five times the surface area of human noses. For all this smelling surface to fit inside, it must be folded many times. You can observe this by looking inside the coyote skull. The many tiny bones you see are covered with tissues containing cells that receive smells and pass them on to the brain. The more of these cells an animal has in it's nose, the better it can smell. Many carnivores have such a good sense of smell that they can find food that may be far away. (Try an experiment with your dog, and see if they can smell a piece of meat hidden in your yard.)

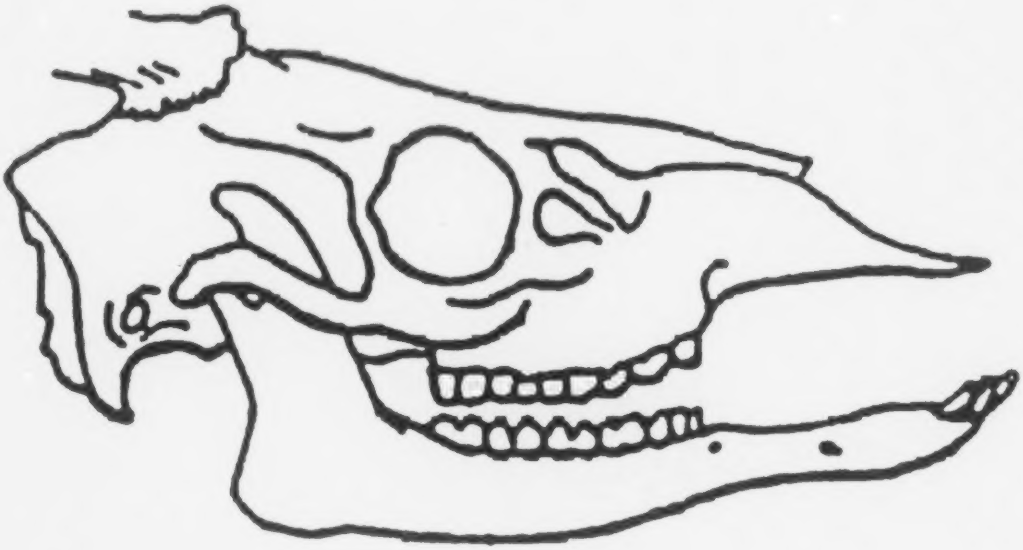
On some herbivores, you will notice appendages that grow out of the top of the skull. These ***antlers*** are present on all male members of the deer family (deer, moose, and elk). They are grown by the males each year, and are shed, or lost in the late winter and early spring. Some elk antlers weigh more than 30 pounds each. Imagine carrying 60 pounds on your head! You might want to research just why some animals have this unusual adaptation.

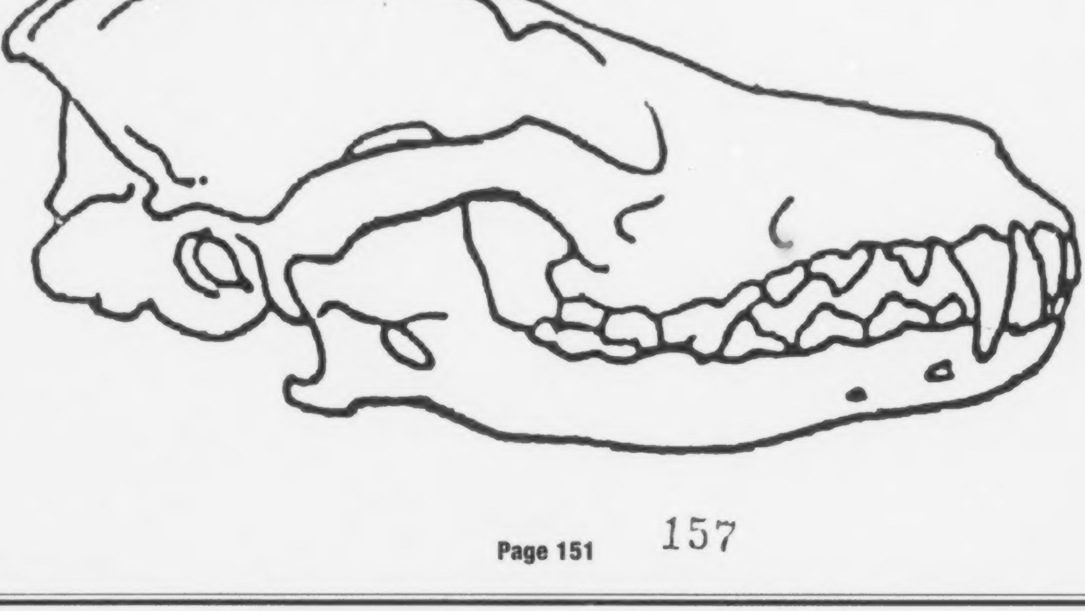
In addition to the presence of antlers, by carefully observing two skulls of the same species, you may note individual differences. Some may be larger or smaller depending on the age of the animal when it died. Age can also be noted by the wear on the teeth. Older animals often have teeth that are flattened or ground down. Imagine the difficulties of an animal that has an injured tooth.

Please handle all skulls carefully so that other students may enjoy learning from them. Thank you!

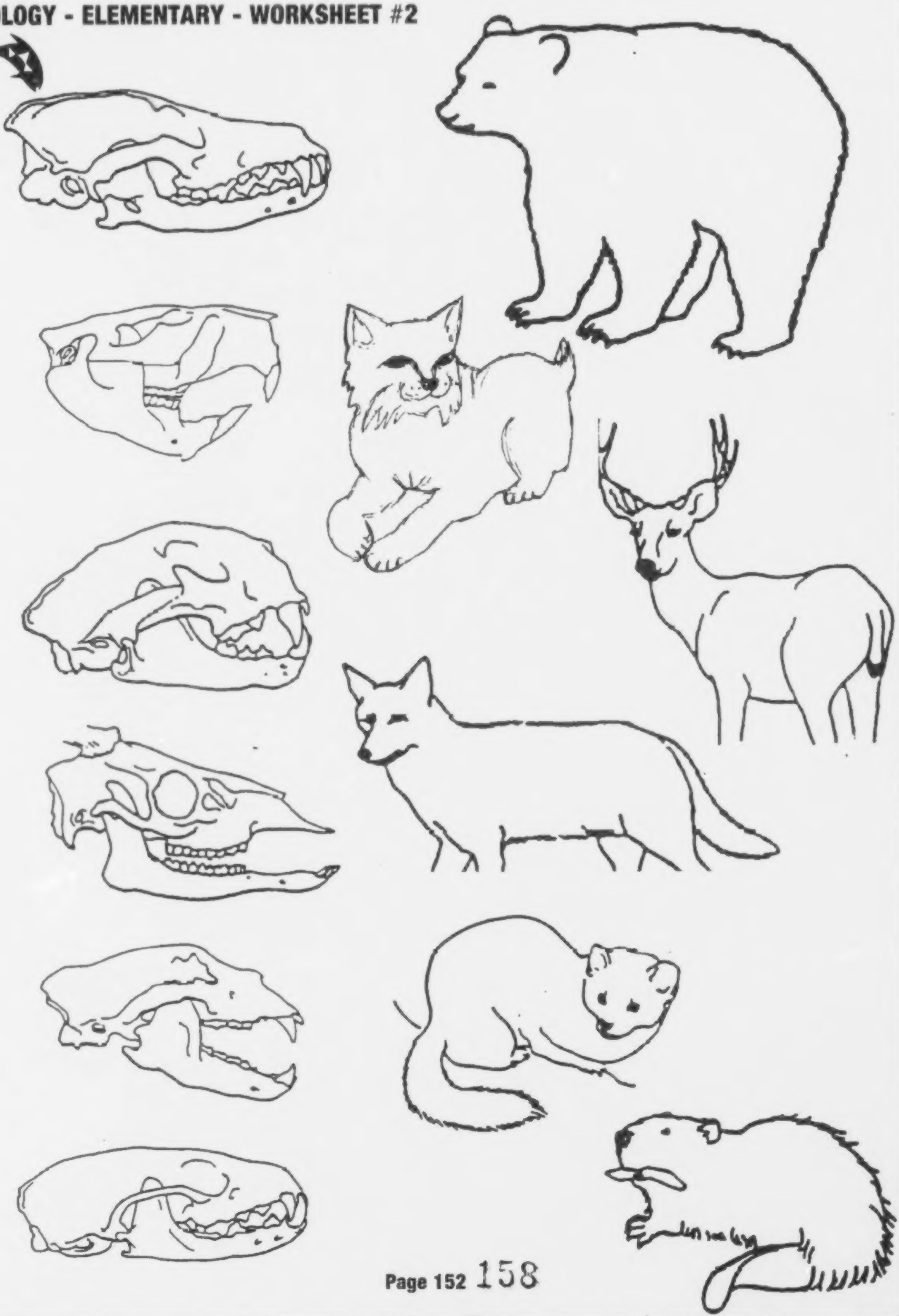
Vocabulary:

- herbivore
- carnivore
- omnivore
- species
- natural community
- environment
- incisor
- canine
- premolars & molars
- ungulates
- rodents
- predator
- prey
- mammals

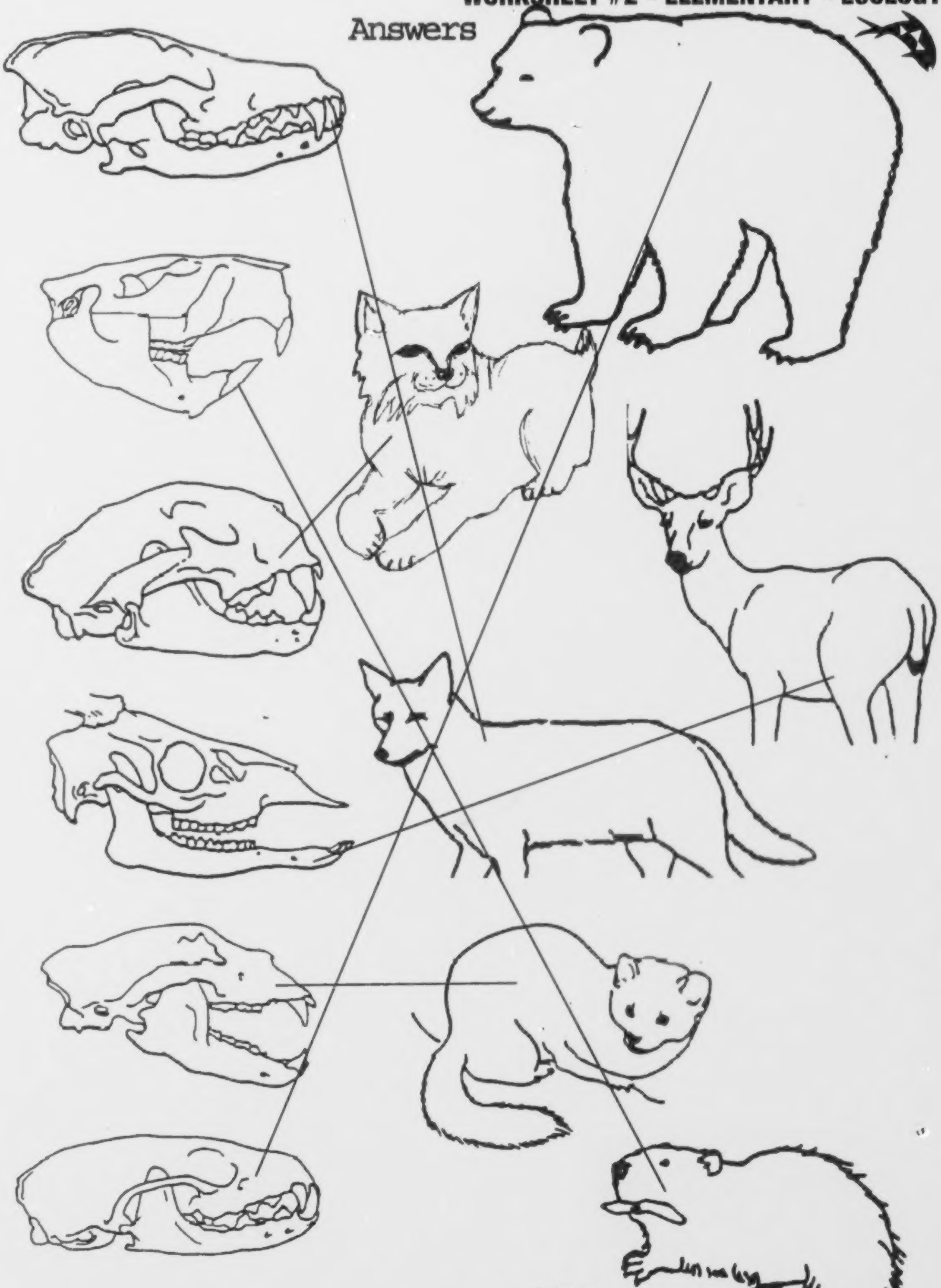




ECOLOGY - ELEMENTARY - WORKSHEET #2



Answers



CONNECTIONS

Lesson 1: Words From the Lorax

Objectives:

- Students will be able to give one example of a connection between their daily lives and natural resources.
- Students will recognize the importance of sound land management practices and its connections to environmental quality.

Background:

In the 20th century it is often difficult to conceive of the relationships between our daily lives and the resources we use. Even when this connection is made, it is easy to assume that "someone else" is using up all the resources. The first activity traces connections between common items we all use, and natural resources.

The Lorax, *by Dr. Seuss, symbolically describes the impacts human ventures and economic demand can have on natural environments. It also introduces the concept of values, as they relate to management philosophies. For all the color, humor, and rhyme, it contains many of the issues that challenge resource managers today.*

Just as the Onceler, at the end of the book recognizes the need for forests that are protected from "axes that hack", so the government recognizes the importance of establishing Wildernesses.

See Also:

- Community Connections—(Elementary-Ecology), Page 141
- Ecosystems—(Middle-Ecology), Page 277
- Fire's Role in Wilderness—(Middle-Ecology), Page 279

Activity 1: From Pencils to Dinosaurs

Materials:	Pencil Large group writing paper
Procedure:	1) Challenge students to think about where a pencil comes from. You may wish to illustrate this by taping a pencil in the middle of the large paper and creating a branching diagram that goes out from it. 2) The materials in the pencil could provide the first circle of words in your diagram (wood, lead, metal, rubber, paint). Trace the origin of these describing all the people, equipment, and resources used along the way. For example: wood from *trees* that were transported by *truck* that was fueled by *gas* that comes from *fossil fuels*, (this is where the dinosaur comes in!) that were created in the era of the *dinosaurs*. You could also talk about the driver of the truck who buys *oranges* for lunch that were brought from Florida by another *truck*, and so on. This web can really go on forever with

varying degrees of connectedness! Be reasonable, but take it far enough to convey the concept.

3) Have students select other classroom items and repeat the activity in small groups, circling all the descriptions that use or impact natural resources.

4) Have them do a journal.

Activity 2: The Lorax

Materials:
The Lorax by Dr. Seuss
individual writing materials
journal
package of corn seeds

Procedure:

1) Preview the story before reading. In the story, the 'Lorax' is a strong opponent of the 'Onceler' who comes to the once beautiful forest and creates a factory that manufactures 'thneeds' from the 'truffula trees', eventually destroying the forest and driving the wildlife away with it's pollution.

2) The symbolism in the book is undeniably related to timber harvesting. As you discuss the book, encourage students to think beyond who is 'right' or 'wrong', 'good' or 'bad'. The questions are intended to challenge students to view the story from different perspectives and to take a problem solving approach to the issues.

- Why were the truffula trees cut down? How did that affect other living things in the forest? How did you feel about this use of resources?
- What exactly is a "thneed"? Are there things we own that are 'thneeds'?
- Would you have felt differently about the trees being cut if they were going into the production of 'needs', things people needed to survive.
- Describe all the actions that occurred in the forest as a result of the factory? Do you think the people buying the thneeds thought of these connections?
- Why is the Onceler's face never illustrated? Why does he have this name? Take the point of view of the Onceler. Why was he producing thneeds? In what ways did this help people? (jobs, etc.)
- Take the point of view of the Lorax. Why was he concerned about the forest?
- Is there a way thneeds could have been produced and the forest maintained? What about replanting? Cutting only small sections? Providing pollution controls? Recycling, reducing, reusing? Preserving this area and cutting somewhere else? *All these are big issues of regional and national debate. This discussion could lead into problem solving activities of your choice.*

Extensions:

- Invite a forester or other land manager to your class to discuss current practices.
- Research current timber cutting, grazing or mining issues. Compare the information from news-

papers, magazines, forestry information brochures, and environmental organizations.

*Addresses of agency offices are located in the box. Environmental Organizations are listed in the further readings and reference section.

Evaluation:

Finish with a responsive writing exercise. Give each child a corn seed to imagine it is a truffula seed. Following are suggestions for writing activities:

Describe why the word "Unless" is such an important word in this book.

Write about what you would do with a truffula seed.

Write an imaginary letter to the Lorax or the Onceler.

Create a continuation of the story.

"Unless someone like you cares a whole awful lot, things aren't going to get better, they're not!"

—The Onceler in The Lorax by Dr. Seuss

Lesson 2: Wild Air/City Air

Objectives:

- Students will be able to describe how air pollution and other forms of pollution cross wilderness boundaries and be able to give examples.
- Students will be able to name two ways that they can help reduce air pollution.

Background:

"Wilderness" presents images of clean water and fresh air. These two simple things are sought after by visitors who enjoy recreating away from the urban areas in which they live. Pollution from communities is, however, evidenced in seemingly distant wildernesses. Air pollution transported via air currents from cities to high elevations affects visibility and aesthetic enjoyment of wilderness users. In the form of acid precipitation, it also affects the acidity of lakes, altering which organisms can live there and the health of aquatic ecosystems and vegetation. Evidence suggests this form of pollution may also reduce the growth rate of plants and trees in some areas. For more on acid rain refer to ***'Middle School: Connections (Page 287).'***

This lesson seeks to increase student awareness of air pollution, it's penetration of wilderness boundaries, and ways in which their lifestyles may reduce air pollution.

Because the scope of teaching about pollution is larger than that of this strand, you will need to reference other materials for introductory information and lessons dealing with pollution. An excellent reference is ***Ranger Rick's Naturescope****. There are many excellent curricula about pollution and the importance of preserving clean water and air through reducing, reusing, and recycling. We will focus here on the ways pollution affects wilderness preservation.*

See Also:

- Wild Water—(Elementary-Connections), Page 163
- Acid Rain and Wild Places—(Middle-Connections), Page 287
- Water: Wet and Wild—(Middle-Connections), Page 293

Activity 1: What is Air Pollution?

Materials: Review Procedure

Procedure: 1) Have students take a deep breath and then ask them to describe what air is. What kinds of things need air to survive? What does it taste like? Smell like? Is it visible?

2) Discuss and define air pollution: What it does and where it comes from. Most air pollution comes from the combustion of materials that put small particles into the air that are harmful to humans and other living things.

3) Perform one or both of the following demonstrations.

- Light a candle and hold a Pyrex or heat resistant surface over it. Remove and observe the accumulated soot. This is air pollution we can see.
- Dirty sock experiment: Take a sock or coffee filter and place it over the exhaust pipe of your car. Start the car and run for a few minutes. Stop car & remove sock CAREFULLY. Take to class and show students the

results. **This is not a hands on experiment for students and they should be clearly instructed never to try this without an adult.**

4) Look out your window, take a walk, or brainstorm sources of air pollution. Make a list of these sources and save for Activity 2.

Activity 2: Wilderness Boundaries & Air Pollution

Materials:

National or State Wilderness Status Map

Sign for student to hold, with name of nearest Wilderness Area or students can make a Wilderness Boundary with their bodies while holding hands.

6-10 ft. string

2-4 chalky erasers

2 Large, simple folded paper fans

Procedure:

1) On the map, locate your community and the nearest Wilderness, noting the distinct Wilderness boundary delineated by color or line and estimating the distance to it's location.

2) Discuss what this boundary would physically look like. Wildernesses are marked with minimal signs that inform visitors when they enter the area at a trailhead, or cross into it on a trail. Explain also that boundaries are created as guidelines for managing different areas for different purposes.

3) Select one student to represent the Wilderness by holding the sign, and encircle them with the string on the floor. The string is the Wilderness boundary.

4) Choose one or two students and place them near the Wilderness with the erasers, representing pollution from your community. (Ask them to refrain from slapping the erasers together until all are ready.) Review the pollution sources you identified in Activity 1, and if you wish, identify other students to represent these sources, and have them stand near Pollution.

5) Two more students can represent wind using the fans. Position them so that Pollution is between Wind and the Wilderness.

6) When everyone is ready, direct Wind to wave their fans and blow such that they move the air in the direction of Pollution. The Pollution student slaps the erasers together as they do so.

7) If all goes as planned, you should notice chalk within the Wilderness boundary!

8) Discuss the inability of boundaries to keep out air pollution. What other kinds of pollution could pass into wild places? (Water, noise)

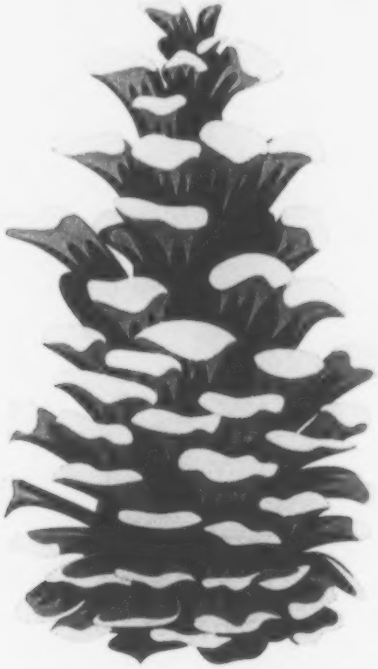
9) Refer to your original list of air pollutants and share ideas about how personal choices may influence air quality. (carpooling; reducing, reusing, recycling, etc.)

Extensions:

- Investigate ***Ranger Rick's Naturescope: Pollution: Problems & Solutions*** for some great information and activities about pollution.
- Take a litter walk and collect trash around your school yard. Emphasize that wild places are not the only places important to keep clean.
- Examine student lunches or snacks and give points for reduced, reused, or recycled materials. Design a score keeping system. If you're really brave, do the same with a full trash container. Weigh the total contents, divide into recyclable materials, note the percentage of materials that could be recycled. This might be a good start to a class recycling project.

Evaluation:

Have students make a list of materials or pollution that could pass into wild places. Have them draw a picture of the source and how it could effect a Wilderness.



(Forests are) the "lungs" of our land, purifying the air
and giving fresh strength to our people.
—Franklin D. Roosevelt

Lesson 3: Wild Water

Objectives:

- Students will describe the water cycle.
- Students will locate on a map the geographical source of their water supply.
- Students will describe one way in which water pollution is detrimental to environmental quality and quality of life.

Background:

In many states large urban areas are connected to high mountain wilderness through their water supply. The designation of these areas helps to protect the purity of water that eventually reaches thousands of households. As you trace your own water supply you may find that it begins or passes through wilderness.

Activity 1 describes how water cycles from one form to another and how living organisms depend on water. From the surface of lakes and oceans water is changed into water vapor through the addition of light/heat energy, a process called evaporation. Water vapor in the atmosphere eventually condenses into clouds and is moved over land by air currents. Water then falls to the ground as precipitation in the form of rain or snow. Once on the ground, water can either run off into streams, lakes, and eventually the ocean (where it can once more evaporate), or it can soak into the soil. If it soaks into the soil, it may seep down into underground rivers and eventually out to sea (to again evaporate). Or, it may be taken up by plants and other organisms. Plants take up minerals that are dissolved in water. Their leaves extract the needed minerals and send the excess water out into the atmosphere—a process called transpiration.

Your community may be upstream, downstream, or between wild areas. In activity 2 students examine the upstream geographic water source for their community. Activity 3 addresses the effects of water pollution on the quality of life downstream from its source.

In the dynamic water cycle, the qualities of water such as temperature or chemical make-up can change rapidly in response to a number of factors and these changes can be harmful or beneficial to different plant and animal species or to humans. Water is considered polluted when a harmful substance is introduced into it or an adverse change occurs to one or more of its qualities. In each case, the "harm" done depends on which species are affected and their reactions to or tolerance of the concentration of that particular pollutant in the water. Severe pollution can reduce or eliminate beneficial uses of water such as fish and wildlife habitat and human uses of water for households, irrigation and recreation.

Substances or changes in the water can be caused by human activities or by natural processes and events. Human activities which can result in pollution include agriculture, logging, industrial development, sewage disposal, and garbage dumps. (These activities are disallowed in Wildernesses.) However, when these activities are conducted properly, pollution can be avoided or reduced to low levels.

Understanding pollution's effects and causes prepares us to take constructive action now and in the future to protect and maintain a healthy environment. The effects of any kind of water pollution depend on the severity of the pollution, the length of time over which the pollution occurs, the time of year, and the presence of other pollutants. The major purpose of this activity is for students to increase their understanding of water pollution and its potential effects on human and wildlife habitats.

CONNECTIONS - ELEMENTARY

See Also:

- Wild Air/City Air—(Elementary-Connections), Page 159
- Acid Rain and Wild Places—(Middle-Connections), Page 287
- Water: Wet and Wild—(Middle-Connections), Page 293

Activity 1: Water Cycle

Materials:

glass of water

wet sponge

blackboard

hot plate

oven-safe ceramic dish or pan with a glass top

Water Cycle Role Cards—cut and glued on index cards with role name written on the other side (follow lesson on Page 169)

Water Cycle Poster

Water Cycle Illustration

Procedure:

1) Show students a glass of water and tell them that it could contain some of the same water splashed in by a woolly mammoth or sipped by King Tut or washed in a gold pan by a miner in the Sierra Nevada. Ask students to think of how this could be possible.

2) Ask students where rain comes from. Ask where clouds come from. Explain that clouds are made up of microscopic water droplets. To demonstrate evaporation have a student put a wet sponge or wet handprint on the blackboard and watch it evaporate. Note that just as in this example water changed into a vapor, so also water evaporates into the air off the surface of all bodies of water.

3) Now ask how water changes to form clouds. How can we get water vapor in the air to change into a liquid. Heat an oven-safe ceramic pan or dish with a little water in it on a hot plate without the lid. If accessible, place the lid in a refrigerator or freezer. As the water starts to warm, place the lid on the pan. Water droplets should form on the lid. Ask students to suggest why this is occurring. This happens as water vapor contained in the warm air condenses against the cooler surface. Point out that condensation and evaporation are opposite processes. Note that land obstructions such as mountains, force air to rise, cool, and drop some of its moisture.

4) Have the Water Cycle Role Cards ready. Bring individuals or small groups of volunteers up one at a time in front of the room. Each new group will read the complete sentence on the card handed to them. Other groups will read a portion of their card in order of the water cycle (they will not say "We are the" after the first reading). For example, the first time, the group will read "We are the people that go to the ocean to bring home a fish." The second time, the second group reads their entire card followed by the

first group reading "people that go to the ocean to bring home a fish," and so on until the final reading is of the entire water cycle. Have the students end up in a circle to demonstrate that the cycle is continuous. Encourage students to come up with appropriate gestures or movements for their parts.

Extension: Use the Water Cycle Illustration that follows the lesson to make a transparency/ overhead Have students explain the water cycle illustration or the water cycle poster located in the box.

Credit: This Activity is excerpted from **"Wetlands & Wildlife"** a curriculum developed by the Alaska Department of Fish & Game and the US Fish & Wildlife Service. It is further referenced to "Water Water Everywhere—Now you see it...Now you Don't" from Oregon State University and Oregon Department of Education Sea Grant program.

Activity 2: Upstream Clean

Materials: **National Wilderness Preservation System Map**

Large clear container of water

Procedure: 1) Before beginning this activity it may be helpful to do a bit of research about the source of water for your community and the streams, reservoirs, and transfer systems involved. Contact local community and state organizations involved with watershed resource issues.

2) Explain that in this activity students will be applying what they have learned in Activity 1, specifically to the water sources of their state. Using maps, you are going to follow a drop of water that came out of your faucet and into the container, back to its furthest possible land source. Use the **NWPS Map** and others that include waterways. Have students write or draw the pathway as you describe it together.

3) Note any place you pass through federal protected lands as well as changes in elevation. As you trace back through reservoirs or lakes, follow streams that drain into them. Depending on the detail of your maps you may be able to trace these streams to smaller tributaries or even to small glaciers!

4) Estimate the greatest distance traveled by a drop of water to get to your faucet and if possible also note the changes in elevation that would occur.

5) Develop a flow chart of your community's watershed.

Activity 3: Keep it Clean for Downstream

Materials: Large, clear container of water.

Baby oil (representing oil)

Food coloring (representing paint)

Biodegradable soap (representing other pollutants)

Large bowl or bucket

100 colored paper 'tokens' approx. 1/2" x 1/'2" cut from each of 8 different

colors

Writing or graphing paper, Scotch tape or glue

Pollutant Information Cards (one copy for each group)(Page 173)

Tablespoon for measuring

Procedure:

1) Divide students into groups of 3 or 4. Introduce this activity by bringing in a large container of water and having students write down as many uses as they can think of that living things have for water.

2) Next, with student assistance, "pollute" the water by adding the various substances including oil of some kind. For special effects, dip a piece of paper or a feather in the mixture. Notice that the oil does not mix with the water. You might discuss why oil spills are so devastating to wildlife that must move through this heavy film.

3) Return to the writing activity and have students circle those descriptions that could still apply to this water. (i.e., would you still want to swim in it? could animals live in it?)

4) Note that not all water pollution is as visible. Some chemicals and pesticides are colorless, and odorless, but may have drastic impacts on the quality of water. To symbolize these pollutants mix the different colors of paper tokens in a container.

5) Pass out the Pollutant Information Cards. Review each kind of pollution with the students. Color code each with a different color of paper and make a poster as a key. Post a piece of each color with its corresponding description of the kind of pollution it represents.

6) Explain that each group will be a research team. Each team will analyze the pollution content of a hypothetical stream that flows into a wild habitat or wetland. Provide each team with one tablespoon of the mixed tokens representing water from different rivers. Each group will also need a piece of graph paper.

7) Together list along one axis of the graph the eight different types of pollution described, in the same order for ease of comparison at the conclusion of the activity.

8) Have each group separate their tokens into different pollution types and create a simple bar graph by gluing them to their graph paper.

9) When all are complete, compare results. Then tell students that any quantity above two units of each kind of pollutant represents a concentration that is damaging to living organisms that use the water.

10) Read **"A River Ran Wild"** and discuss the obvious downstream impacts of water pollution, on human as well as plant and animal communities. Discuss the actions the main character took to clean up the river.

11) Conclude by having students list five things people could do to reduce the

number of pollutants added to the environment.

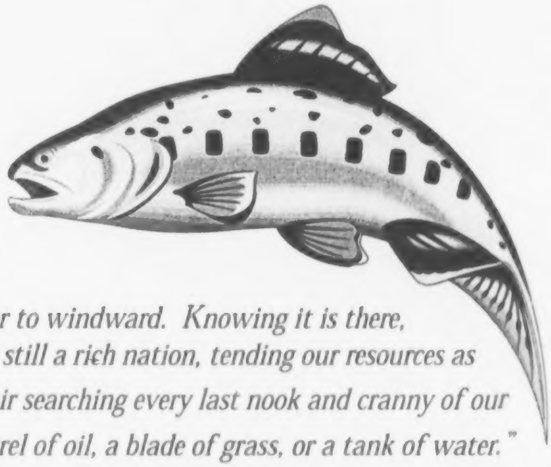
Credit: This Activity is excerpted from **"Wetlands & Wildlife"** a curriculum developed by the Alaska Department of Fish & Game and the US Fish & Wildlife Service. It is further referenced to **Project Wild**, "Deadly Waters."

Extensions:

- The Colorado Division of Wildlife & Colorado Heritage Foundation have produced an excellent Activity Guide and Video **"Water Wonders"** Available through Colorado Wildlife Heritage Foundation, P.O. Box 211512, Denver, CO 80221 (303) 291-7212.
- Use **Water Cycle** poster to discuss the water cycle.
- Read ***The Last Bit Bear*** by Sandra Robinson, a fable about the connection between pollution, habitat destruction and endangered species.
- Repeat activity using 'real' pollutants such as automobile oil and paint, and problem solve the best way to dispose of this mixture in your community.
- Have students use crayons and watercolors to illustrate the water cycle.
- As a writing exercise students could create adventure stories about traveling through the water cycle from the perspective of a drop of water.
- Create your own guided imagery exercise in which students imagine they are drops of water moving through the water cycle. As a variation, include encounters with pollution along the way.

Evaluation:

Have students describe where their water comes from in the context of the water cycle and describe one way each that human actions can negatively and positively affect the water that leaves your community.

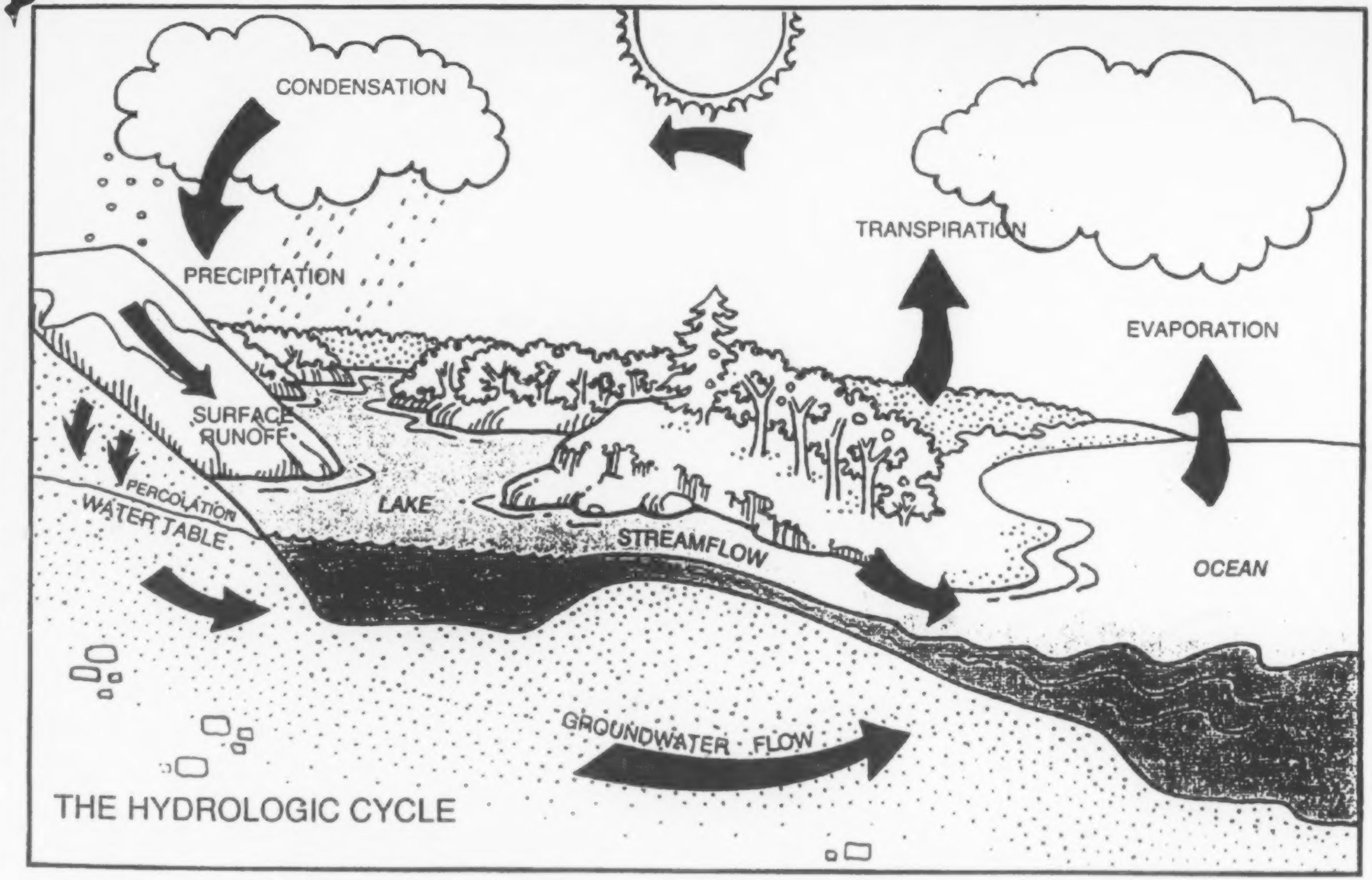


"Wilderness is an anchor to windward. Knowing it is there, we can also know that we are still a rich nation, tending our resources as we should - not a people in despair searching every last nook and cranny of our land for a board of lumber, a barrel of oil, a blade of grass, or a tank of water."
—Senator Clinton Anderson in American Forests, July 1963

Water Cycle Role Cards

1. People	We are the **people** that go to the ocean to bring home a fish.
2. River	We are the **rivers**, fed by lakes and Groundwater that flows across the land and moves to the ocean where there are...
3. Lake	We are the **lakes** that hold water until it moves to the...
4. Groundwater	We are the **groundwater** that filters throughout the soil and moves slowly to the...
5. Wetland	We are the **wetlands** that provide habitat for waterfowl and helps to add to the...
6. Plant	We are the **plants** that pump mineral-rich water up from the soil and transpires the extra water while living in a...
7. Rain	We are the **rain** that falls as precipitation to the ground and is used by the...
8. Clouds	We are the **clouds** that form by condensation that gives us the...
9. Sun	We are the **sun** that evaporates the ocean and is covered by...
10. Ocean	We are the **ocean** where fresh water meets salt water for the...

Credit: Wetlands & Wildlife; U.S. Fish and Wildlife Service & Alaska Dept of Fish and Game.

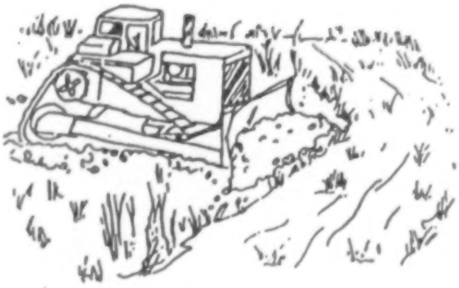

CONDENSATION
PRECIPITATION
TRANSPIRATION
EVAPORATION
SURFACE RUNOFF
PERCOLATION
WATER TABLE
LAKE
STREAMFLOW
OCEAN
GROUNDWATER FLOW
THE HYDROLOGIC CYCLE

Credit: Environment Canada

Pollutant Information Cards

TYPE OF POLLUTION: SEDIMENT

Particles of soil, sand, clay, and minerals wash into streams and rivers. In large quantities, these natural materials can be considered a pollutant.

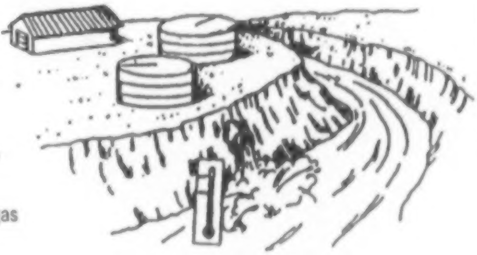


EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN SEDIMENT POLLUTION: Construction projects that clear land (i.e., building roads, houses, businesses, airports), removal of trees for timber harvest, placer and strip mining, agriculture near streams end, building dams or other structures that control water flow.

PREVENTION: Leaving strips of trees and plants around cleared or logged areas, settling ponds.

TYPE OF POLLUTION: THERMAL (WATER TEMPERATURE CHANGE)

A change in normal water temperature is considered thermal pollution.

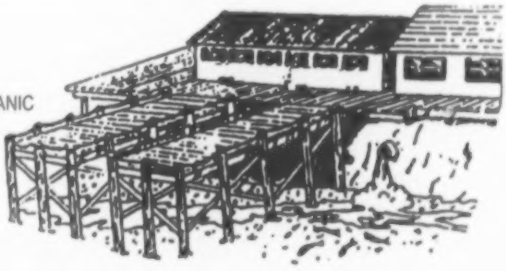


EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN WATER TEMPERATURE CHANGES: Discharges from power plants, logging of trees along streams that provide shade, discharges from sewage treatment plants during winter, burial of heated or cooled oil or gas pipelines under rivers and wetlands.

PREVENTION: Cooling water before discharge, leaving strips of trees for shade, insulation of heated or cooled pipelines.

TYPE OF POLLUTION: ORGANIC

Organic wastes consist of materials that were once alive.

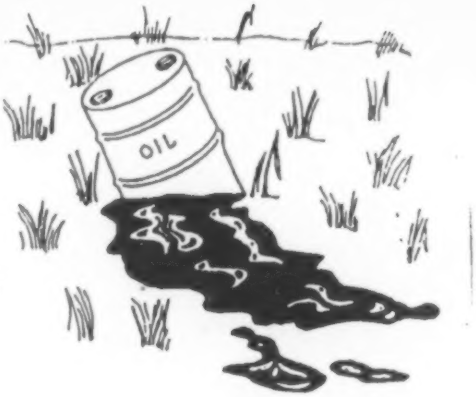


EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN ORGANIC POLLUTION: Direct discharge of sewage into streams or wetlands, discharge of large quantities of fish wastes from processing plants, discharge of logging wastes from harvest areas and pulp mills.

PREVENTION: Treatment of sewage or other wastes or disposal where the water system is not overloaded.

CONNECTIONS - ELEMENTARY - WORKSHEET # 2

TYPE OF POLLUTION: OIL AND OTHER PETROLEUM PRODUCTS

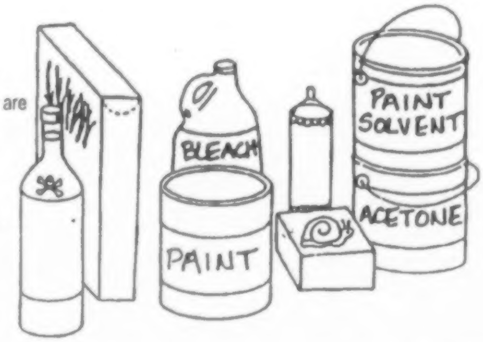


Oil is a very visible pollutant at high concentrations. Since most petroleum products are less dense than water, they float and are often visible as a sheet or sheen on the water surface. Tiny particles of oil may be suspended in water that is mixed thoroughly (by wind, waves, or agitation). Spilled oil that "disappears" may often still be present in a suspended state or as a coating on the bottom of a water body.

EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN OIL POLLUTION: Disposal of oil in water or onto wetlands (e.g., draining a car's oil), spills during development, storage, or transportation of oil; leakage from underground tanks.

PREVENTION: Using disposal areas that are not connected to streams or wetlands, avoiding spills, and inspecting underground storage tanks.

TYPE OF POLLUTION: TOXIC SUBSTANCES

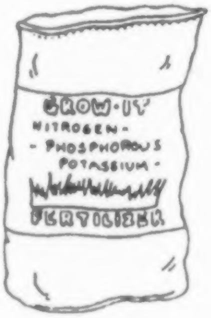


A wide variety of chemicals, including pesticides, herbicides, and waste products, are toxic or harmful to different types of fish and wildlife. Many are also toxic to humans.

EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN TOXIC POLLUTION: Agriculture, gardening, forest management, clearing land, mosquito control, discharge of detergents, mining, manufacturing

PREVENTION: Finding and using non-toxic alternatives, using and disposing of chemicals in such a way that they will not enter water.

TYPE OF POLLUTION: FERTILIZERS



Fertilizers often contain large amounts of nitrogen and phosphorus, nutrients which are usually limited in most ecosystems .

EXAMPLES OF HUMAN ACTIVITIES THAT CAN RESULT IN FERTILIZER POLLUTION: Agricultural and garden run-off, discharge of nutrient-rich water.

PREVENTION: Preventing run-off into streams and wetlands that will become overloaded by the nutrients.

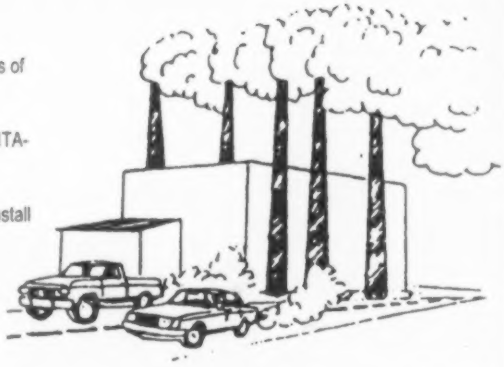
WORKSHEET # 2 - ELEMENTARY - CONNECTIONS

TYPE OF POLLUTION: CHANGES IN ACIDITY (pH)

pH is a measure of the acidity (low pH) or alkalinity (high pH) of waters. Values of either too high or too low pH will affect organisms living in the water.

EXAMPLES OF HUMAN ACTIVITIES THAT MAY RESULT IN ACID PRECIPITATION: Air pollution resulting from burning of fossil fuels.

PREVENTION: Reduce burning of fossil fuels through energy conservation; install pollution control devices on smokestacks .

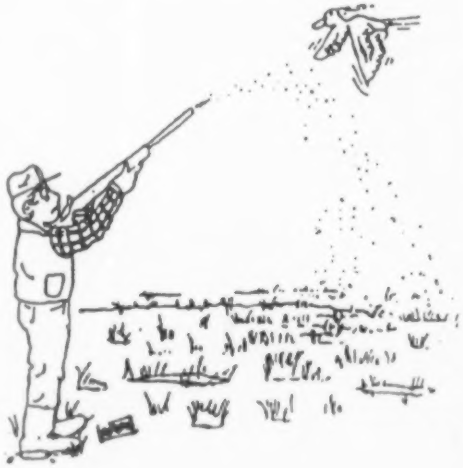


TYPE OF POLLUTION: HEAVY METALS

Heavy metal pollutants include zinc, cadmium, copper, lead, mercury, and selenium.

EXAMPLES OF HUMAN ACTIVITIES THAT MAY RESULT IN HEAVY METAL POLLUTION: Disposal of mining wastes, agricultural runoff, use of lead shot to hunt waterfowl, garbage dumps, atmospheric pollution.

PREVENTION: Avoid disposal and runoff into streams and wetlands, substitute steel shot for lead shot, treat wastes to remove heavy metals or convert them to less harmful forms.



SKILLS

Lesson 1: Basic Map Skills

Objective:

- Students will understand that a map is a representation of landforms and terrain.

Background:

Map and compass skills are among the more difficult outdoor skills to teach but are also some of the most freeing once they are mastered. In Scotland, a national orienteering curriculum developed by Carol McNeill and Tom Renfrew is taught in physical education classes and outdoor education centers beginning with 6 year olds! A modified version of one of their activities is suggested here as a beginning point. Map skills are really skills in interpreting symbols. Elementary students have the ability to do abstract conceptualization that will permit them to learn this, as long as they can begin simply. The second activity suggested here, the construction of a small diorama, will help students understand the map as a miniature representation of the world, including terrain features.

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary Skills), Page 185
- Wilderness Decision-Making and Group Dynamics (Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: A Special Waterfall

Materials:
Paper,
Crayons and/or pencils,
Water basin,
Blue rope or cord,
Potted plants or traffic cones,
Chair,
Defined area with a perimeter (rope or chalk line)

Procedure:
1) Seat the students around the "Wilderness" perimeter. Give out paper and crayons. Ask students to draw a picture of the defined area, making the perimeter the same shape. Show them a picture of the area that you have drawn. Point out that different perspectives will result in different maps!

Why are maps different?

2) Place objects that represent Wilderness features inside the area one at a time, and ask students to draw a symbol or picture of each item in the correct location on their map. The water basin represents a lake, the blue rope—a river, the potted plants or traffic cones—trees, the chair—a fire tower. Be creative and come up with your own symbols!

3) The story line is this—Travel back in time 100 years. The class was traveling across this wilderness but got lost. As they traveled they found a beautiful waterfall with deep blue green pools. They took a break and then continued to plan their route back home. Before leaving, they decided to make maps so that they could return to this special place. Ask students to select a place on the map where the deep pool and waterfall are located. Draw an "x" to mark the spot! *Note: Be sure to tell students they would not let any kid go swimming. There would have to be an adult lifeguard present. Discuss water safety with students. Also, no diving or horseplay because of their remoteness.*

4) Looking at the wilderness demonstration area, ask students to point to where the waterfall is located, and describe the route that they would follow to get from where they are seated to the waterfall. Perhaps place a penny where each student's pools and waterfalls are located. Then have them draw their routes on their maps.

Extension:

- As a next step, and perhaps after several sessions with the above activity, students can switch maps and attempt to follow the new map route from its starting point to the waterfall.
- You might also ask students to write a journal entry about the special place: What it is, why they were traveling through the wilderness, and what landmarks there were that corresponded to their maps.

Activity 2: Map in a Box

Materials: One shoe box, pie pan or other similar container for each student

Approximately one pound of salt dough or a clay that will harden for each student, with several different colors

Small plastic trees, wild animals and pebbles

Possibly natural objects like stones and twigs that students can collect; blue paint and small brushes

slide or large picture of a wild landscape with a panoramic view

Procedure: 1) Place the poster or picture of a wild landscape in a place where all students can see it. If the class is not too big you can use a number of pictures. Ask students to describe what they see.

Where are the mountains?

Where are the valleys?

What else can you see: cliffs, streams, lakes, forests, wildlife?

2) Ask students to make a miniature model of the scene in the poster using the clay. The "land" they create should look as much like the land in the poster as possible. Encourage them to use the props that you provide creatively.

3) Once the terrain in the box is completed, students can paint rivers and streams, *even if* the water courses are not visible in the poster. Ask students which way water will flow, if it is not on flat land. If raindrops fell onto the mountain tops, which way would they flow? You will need to advise most students on approximating where the source of a watershed might fall.

Extension:

- If you were a very tiny person in this shoe box land, and you wanted to climb to the top of the very highest mountain, where would you start from, and what would your route be?
- If you have selected a scene with a number of landmarks that students have symbolized, you might have them draw maps of their dioramas.

Evaluation:

Grade map models from each activity.

Lesson 2: Wilderness Rations Planning

Objective:

- Students will be able to explain the characteristics of good food rations, and describe how to prepare several simple recipes.

Background:

Good food plays an especially important role in the success and enjoyment of a wilderness outing. It is essential for staying healthy, maintaining body tissue, and providing energy, mental alertness and a positive attitude. In selecting rations for a trip with given length, the traveler must consider energy content, nutritional balance, bulk and weight, spoilage, expense and availability, ease of packaging and handling, variety, and preparation time. There must be a balance of carbohydrates, fats and proteins, with an adequate caloric content. And most important, it has to taste good!

This lesson is a basic experiential introduction to these concepts. All three activities demonstrate the principles of ration planning, and the students generate these concepts.

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Fabrics and Clothing—(Elementary Skills), Page 185
- Wilderness Decision-Making and Group Dynamics (Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: Gorp Preparation

Materials: Provide students with the following background information: Gorp Ingredients:

Nuts of choice (almonds, peanuts, cashews, pecans, etc.)
Dried fruits of choice (raisins, dates, apricots, coconut, etc)
Seeds of choice (sunflower, sesame, pumpkin, etc.)
M & M's or other chocolate or carob (optional)

Large mixing bowl
Large spoon
Wilderness food bags (12" x 16" x 4 mil. thick plastic bags)
Note: "Ziplocks" tracks cake with food after multiple uses

Procedure: GORP: "Good Old Raisins and Peanuts"

1) Provide students with the following background information:

Background: *An explanation of the nutritional values of the various components of gorp is a good beginning. For wilderness travel, we need more calories than usual, mostly in the form of carbohydrates. Dried fruits are a great source of fructose, a more easily accessible form of simple carbohydrates than sucrose (sugar). Dried fruits also keep well and don't weight much for the calorie value. We need about the same level of protein in backcountry travel that we require in town, perhaps a little more if we undergo considerable exercise or stress. Seeds* *are quite high in usable protein: 19-24%. Nuts are a little lower and provide a higher level of fat content. A pound of pecans provides almost the entire daily requirement of protein for a 128 pound woman, and it also provides about 3000 calories, largely in fat, which is digested much more slowly than carbohydrates, but lasts longer. 3000 calories is a lot for sitting in school, but it's not too much for a day-long wilderness hike!*

2) Provide access to the containers of ingredients. Let students smell the items that interest them, and taste tests are a great idea if individual serving utensils can be provided. Do not let students use their hands to get samples! Mix ingredients approximately as follows, with student recommendations:

Nuts: 50%; Seeds: 10%; Dried fruit: 30%; Chocolate/candy: 10%.

3) Distribute individual servings of gorp to eat. Try to acquire the food bags described in the "Materials" section.

Activity 2: Granola Preparation

Note: This is only one method/philosophy of eating in the backcountry. There are other alternatives. Look at the **NOLS Cookery** or **Wilderness Ranger Cookbook** *for other options.*

Materials:

Granola Ingredients:

- Rolled Oats (oatmeal)
- Fruits of choice (dried)
- Nuts of choice (dried)
- Sweetener of choice (honey, brown sugar, white sugar)
- Margarine
- Salt
- Peanut butter, M & M's (optional)
- Powdered milk, mixed with water to serve as a cereal

Camping stove,

Fuel and matches or lighter

Fry pan with lid,

Spatula,

Pot grips,

"Billy can" (#10 steel can)

Bowls and spoons for all students

Procedures:

1) Granola is prepared fresh regularly in the backcountry on many expeditions because carrying the component ingredients separately provides more flexibility in uses than the same weight in prepared granola. This rationale, as well as the exposure to backpack stoves, are the reasons we suggest you cook this over a stove. However, if one is not available, do the activity over your school stove,

and the final product will be just as good! Start the stove, boil water in the billy can and sterilize all utensils. This is standard operating procedure for any cooking exercise in an organized wilderness-based outing. All students should also wash their hands before eating or handling food.

2) Granola is a high-energy multi-level food that can be prepared quickly and eaten in many different forms. Rolled oats are approximately 9% protein, but the usability of this protein is greatly enhanced when it is combined with nuts or seeds. The addition of margarine and sugar greatly enhances the caloric contents in simple carbohydrates and fats. Eat granola as a cold or hot cereal, as a trail snack, or as an ingredient in breads and casseroles.

3) Melt 3-4 tablespoons of margarine in a fry pan. Add oatmeal, stir and brown. Add a pinch of salt. Add nuts and brown. Add sweeteners to taste. Allow sugars to melt and mix with other ingredients. Add fruits. Continue to fry until mixture is browned and toasted to preference.

4) Serve on paper plates, small cups or other individual servers. Do not allow students to use their hands to serve themselves.

Evaluation:

Assess how well students followed recipe directions by the quality of the finished product.

Lesson 3: Wilderness Fabrics and Clothing

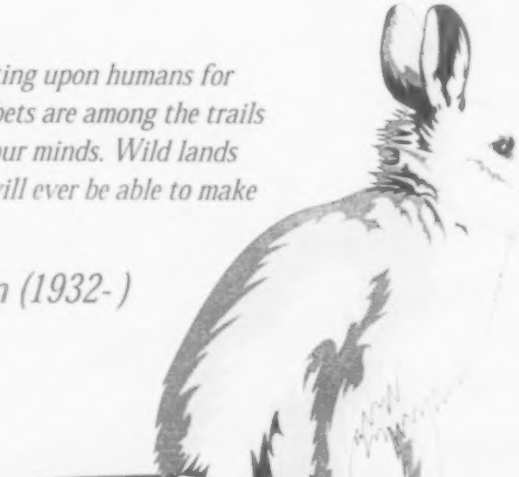
Objective:

- Students will identify the most common fabrics used in backcountry clothing and describe several of their advantages and disadvantages.

Background:

The universe has been quite literally writing upon humans for many thousands of years, and our alphabets are among the trails that nature has carved in order to cross our minds. Wild lands have cut deeper trails in my life than I will ever be able to make in the forest.

—John Meeker, American (1932-)



Outdoor clothing selection teaches many interesting lessons, especially in physics. Principles of thermodynamics, the exothermic reaction of perspiration, relative sizes of water and water vapor molecules all become very concrete issues in selecting clothing for the wilderness. The more technical information is summarized for teachers in the student/teacher information sheet following the lesson (Page 189). If you feel you need more information, the references listed are more thorough.

The three activities of the lesson are, to some extent, sequenced. First, students are introduced to the "well-dressed" wilderness traveler to get the big picture of what is involved in combining clothing. Second, they get to personally experiment with one of the basic principles in, "The Great Wet Sock Experiment." Finally, there is an opportunity to develop some personal knowledge and skill in examining materials in detail. For further background information, read, "Outdoor Clothing Selection" student/teacher information page at the end of this lesson (Page 189).

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Decision-Making and Group Dynamics (Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: The Polar Explorer

Materials:

Wool or synthetic balaklava or ski hat
Wool or synthetic gloves and mittens
Nylon mitten shells
Water and wind resistant nylon parka and pants
Down, pile, or other insulating parkas and pants
Wool shirt and pants
Wool, polypropylene, capilene or other synthetic longjohns
Wool socks
Boots
Glacier glasses or ski goggles are helpful

Procedure:

1) *Note to teacher: If you don't have the background or gear, invite a salesperson from a local outdoor store or a member of a local hiking club or a college recreation management student into your classroom to present this lesson. It's not a bad idea to brief the students beforehand that you will be coming in dressed in all the above garb, and that it is part of a lesson on clothing that is useful in wilderness.*

2) At the beginning of the activity, come in dressed for a winter whiteout above timberline! A Santa Claus beard can be a bonus too if you have that much ham in you. Take off each item of clothing one at a time and talk about its advantages

(and possibly disadvantages). Discuss the fabric it is made from and why, the design, and its functions. Then pass that item around the class, and invite students to try it on. How far you strip is up to you, of course.

3) For the outer layers, explain the basic types of nylon: taffeta, lycra, ripstop, and cordura. Discuss its tight weave and wind resistance, as well as its inability to absorb water into the fibers of the cloth. Explain Goretex and describe its advantages and disadvantages. Discuss the difference between water *resistent* and water*proof*.

4) For the middle layers, compare the basic types of insulation used in outdoor clothing: Down, Celanes Corporation's *Polarguard*, Dupont's *Holofil* and *Qualofil*, and 3M's *Thinsulate*. It's best if you can have at least two different parkas so the students can feel the differences between them for themselves.

5) For the inner layers, compare wool, polypropylene, Capilene, and Thermax. Describe advantages and disadvantages of each. Emphasize the structure, the feel, the look, and even the smell of the material, so that students can learn to recognize them for themselves. This is also a good place to discuss cotton, and why it is not a prominent component of outdoor clothing (i.e., it actually absorbs water into the individual fibers, causing the fabric to stay wet for a long time).

Credit: The background and a more complete discussion of each of the fabrics can be found in Cockrell, D., *The Wilderness Educator* (ICS Books, Merrillville, IN, 1991)

Evaluation:

Ask students to list and describe each clothing layer and its function.

Activity 2: The Great Wet Sock Experiment

Materials: One wool (or polypropylene) sock and one cotton sock for each student

Bucket of water

Procedure: 1) Soak all the socks in water first thing in the morning, and wear them throughout an entire school day. It will be easier to convince students to do this if you do it with them. Ask them to notice which foot felt warmest and what time it was when each foot finally felt truly dry.

2) Debrief the activity at the earliest convenient time: The end of the day or first thing the next day. Which sock dried out quickest? Which was warmest while it was wet? How long did it actually take for each foot to dry? Record drying times for each student on the chalkboard along with the material from which the student's shoe is constructed. A pattern should emerge, with the wool socks generally drying faster and keeping feet warmer while they are wet. Socks in canvas shoes should dry quickest because they are more breathable (although the cotton canvas will tend to retain some wetness). Socks in untreated leather shoes will dry next quickest, and those with snowseal or beeswax will dry slowest.

Extensions:

- There are many ways to extend *The Polar Explorer*. If there is a student in the class with some outdoor experience and gear, use the student as your model instead of yourself. Or bring in a variety of outdoor clothing, and invite the class to dress up your model (or manikin) for a whiteout above timberline.
- Outdoor clothing retailers are often enthusiastic about doing talks on new developments in the outdoor clothing industry. They can demonstrate waterproofing, compressibility, weight, etc.
- Consider researching *real* historic polar explorers and the clothing and equipment they used.

Evaluation:

Grade participation of chalkboard activity.

As we traversed the seemingly endless jumble, we became aware of a sensation new to us: at a time and in a part of the world where opportunity to do so was rapidly vanishing, we knew that this was the way it felt to be pioneers, bound for a land so little visited that it was as if no man had come this way before.

—Phoebe Anne Sumner

OUTDOOR CLOTHING SELECTION

Outdoor clothing must perform several essential functions. It assists the body in retaining heat when external temperatures are cool and the body is inactive, but it must also permit heat to be dissipated when there is an excess. Clothing must also allow water vapor produced by the body to evaporate into the air without prolonged evaporative cooling. Finally, clothing must protect the wearer from skin injuries in the backcountry such as sunburn, abrasion, insect bites, poisonous plants, briars, etc.

Heat is lost from the body in five ways. It is ***radiated*** from the body in the form of infrared radiation. It is lost through ***convection*** as the air immediately adjacent to the body is warmed and then disturbed by wind. It is similarly lost through ***respiration*** as cool air is taken into the lungs, warmed and then exhaled. Heat loss also occurs by ***conduction*** when the body comes in direct contact with some cooler surface, such as the ground, cold pots, snow, rocks, etc. And finally, heat is lost when moisture on the body's surface ***evaporates***—an exothermic chemical reaction. Because an active hiker or climber can sweat four to six liters of perspiration in a day, evaporative heat loss has special implications for clothing selection.

In order to prevent radiation and conduction, some clothing articles must be capable of providing the wearer with "insulation," a thermal barrier of trapped dead air space that conducts heat away from the body as slowly as possible. Because the body, and sometimes the sky(!), are continuously exposing insulating clothing to moisture, it is a valuable asset for clothing to insulate even when it is wet.

A second fundamental principle is to select clothing that keeps the wearer dry. Lots of zippers, buttons and velcro tabs are valuable to allow ventilation during vigorous exercise. Inner layers should be of materials that "wick" moisture away from the skin. Middle insulating layers should "breathe" easily. Protective layers of outer clothing should repel precipitation so that it does not soak through to the inner layers. These must also stop the wind to protect the wearer from convection heat loss, and allow ventilation to minimize evaporative heat loss. Finally, all layers of clothing should dry rapidly, preferably from body heat alone.

Some practicalities enter into clothing selection as well. Clothes should allow complete freedom of movement and not hinder blood circulation. Inner garments should be easy to clean. Outer garments should have large pockets, conveniently located that can be securely fastened. Clothing should be dependable and versatile, with no extra decorations or attachments that could tear or break. Reinforcements in high wear areas such as knees, elbows and seat are a plus. Each item should fit into a "layering" system and have multiple uses. And of course, clothing should be light weight and compressible to minimize space occupied in a pack.

Lesson 4: Leave No Trace

Objective:

- Students will know basic "Leave No Trace" techniques of backcountry use addressing pre-trip planning, backcountry travel, campsite selection and restoration, use of camp stoves, cooking and sanitation, horse use and courtesy for other wildland visitors.

Background:

Over the past several years, the Forest Service has worked in collaboration with the National Outdoor Leadership School and other partners to develop a program to teach skills for protecting the wilderness environment entitled **Leave No Trace!** *The program has produced a variety of curriculum materials for varying audiences, including the following:*

- *"Leave No Trace!" Outdoor Skills and Ethic Booklets*
- *"Leave No Trace!" Poster*
- *Soft Paths. Hampton, B. and Cole, D. (1995).*
- *"Soft Paths or Canyon Soft Paths" videos. (15 and 31 min.)*

One set of these is included in the Wilderness and Land Ethic Box.

The curriculum content for this lesson is the Leave No Trace program. It addresses six principles: (1) Plan ahead and prepare; (2) Camp and travel on durable surfaces; (3) Pack it in, pack it out; (4) Properly dispose of what you can't pack out; (5) Leave what you find; and (6) Minimize use and impact of fires. ***Plan ahead and prepare*** *provides guidelines on group size, where and when to go to wilderness, gear and food for trips and other tips for minimizing impact.* ***Camp and travel on durable surfaces*** *addresses choosing an established campsite in popular, heavy used areas, spreading use in pristine, lightly used areas, and traveling on designated trails.* ***Pack it in, pack it out*** *stresses the need to pack out everything that you bring into wild country, protect wildlife by storing food securely and picking up all litter.* ***Properly dispose of what you can't pack out*** *discusses burying human waste in catholes, using small amounts of biodegradeable soap(if at all), and scattering strained dish water.* ***Leave what you find*** *addresses treating natural heritage with respect, leaving historical artifacts for others to enjoy, and letting nature's sound prevail.* ***Minimize use and impact of fires*** *discusses using camp stoves instead of building a campfire, or if a campfire is built, to use a fire pan or build a mound fire.*

At the elementary level, we are recommending two activities: The Impact Monster Skit and the National Outdoor Leadership School's video, Soft Paths (15 min version). The Impact Monster Skit has been presented in schools by Forest Service personnel since the late 1970's. It is a sure hit with this age level, and you can do it even without the ranger!

See Also:

- Wilderness Impacts—(Primary-Connections), Page 79
- Leave No Trace—(Middle-Skills), Page 341

Activity I: The Impact Monster Skit— A Skit for Teaching Wilderness Use Ethics

Background:

The Impact Monster *skit was developed by Jim Bradley of the Eagel Cap district on the Wallowa Whitman National Forest in the 1970's. It has been used by Wilderness rangers for years to convey the minimum impact message. It has since been adapted to a variety of geographic locations and management issues; as you can see the script lends itself well to versatility. We have found that ages 6 through 12 and families are the best and most appropriate audience; participation is crucial.*

Materials: Props for Elements of the Wilderness may be made from paper or cloth:

- Bunny ears, deer antlers, bear ears, eagle wings;
- Large flowers, blue tarp for lake, limbs for trees;
- Peak, trailhead, bighorn sheep, stars, a lake, sun

Brightly colored clothes for the Impact Monster

Two backpacks

Telephone book,

Cast iron skillet,

Crumpled pop can,

Assorted litter (cigarettes are good)

The characters (see the above list) all need some type of costume. The costume can be as simple as poster board antlers or horns, blue material for the lake, cardboard branches for the trees, and bright colored clothing for the Impact Monster. Be creative; the more costumes, the more fun the kids will have.

Procedure: Preparation: Ideally, you need three people who know the skit—the narrator, the wilderness visitor, and the Impact Monster. The rest of the characters come right out of the audience. The remainder of the audience participates by the narrator asking questions throughout the script.

We do a few activities first, teach some wilderness skills like campsite selection, using stoves for cooking, the pro's and con's of wood fires, map reading etc. This skit acts as the final act and it summarizes many of the things we have taught.

Make sure that at a minimum you are able to explain the concept of "wilderness." We talk about all the different land management agencies—National Park Service, U.S. Forest Service, Bureau of Land Management, Fish and Wildlife Service and explain the difference and similarities of these agencies.

"What do you think a wilderness is?" is a good question. Take the word apart, and talk about what "wild" means. So wilderness is a place that is wild, where plants and animals are allowed to exist according to natural processes. No motorized vehicles or bicycles, or hot dog stands or houses, no mining or logging. Once they've gotten a feeling for what Wilderness is, you can go into the skit.

The Impact Monster Skit

Narrator:

This skit is about walking and camping in the wilds. It's about a monster named "Impact." Do you know what "Impact" means? It means change or disturbance.

We're going to create a wilderness setting, so I need some volunteers. What kinds of things do you find in the wilderness? Let's see, I need:

- some flowers
- a trailhead
- a tree
- a deer
- a bighorn sheep
- an eagle
- a snowshoe hare
- a peak
- some stars
- a lake
- the sun

Note: Arrange the stage, setting the characters in their logical places. You will need to take the following characters aside and explain that they have important roles: snowshoe hare, stars, eagle and flowers. As the narrator recites his or her lines, each character (including the wilderness visitor and the Impact Monster) should do what comes naturally for the role.

Narrator:

We're going to take a walk. It's a summer day high in the mountains of our state. After driving to our starting point, the wilderness trailhead, our wilderness visitor begins his or her journey. After packing a backpack and then stretching, the visitor takes a good long look at the information posted at the trailhead.

[Ask why a hiker should read the information at the trailhead.]

The visitor begins walking quietly up the trail, looking up and around often. An eagle soars high in the sky. The visitor watches as the eagle swoops down and just misses a snowshoe hare leaping through the meadow. The visitor starts up a hill with long, steep switchbacks.

[Ask why a person should stay on the switchbacks.]

The visitor stops for water at the top of the hill and notices a bighorn sheep feeding on the side of a hill in the distance. He or she takes out the binoculars and watches, content to observe from a distance.

[Ask why it's best to watch wildlife from a distance—explain that it's important to remember that they're inhabitants and need to go about their daily business undisturbed, and that that's important to their survival as wild animals. It's also safer for the visitor.]

The visitor sees some trash on the ground and picks it up. He or she then sees a pretty flower and stops to admire it—but knows not to pick it because it will die.

The visitor finally arrives at the destination—a beautiful lake—and must decide where to camp.

> [What should the visitor think about when choosing a campsite? It should be a site that has been used before that's away from the trail, away from water, and protected from wind.]

So the visitor sets up the tent, puts on camp shoes, and goes down to fetch water from the lake. After bringing the water back up to the campsite, the visitor washes up—well away from the lake. The visitor sets up a stove to cook food, and at last relaxes in the nice protected campsite.

Then another visitor arrives on the scene. Can you guess who this is?

Yes, here it comes ...

Impact Monster enters scene, and proceeds to do the following:

1. Shortcuts trail, ignoring switchbacks and stumbling up the hill
2. Carves initials on a sign. ("I want everyone to know I was here, I.M. The Impact Monster," it proclaims)
3. Smokes cigarettes, throws butts on ground
4. Sees a flower, picks it and throws it on the ground
5. Sees rattlesnake; shoots it
6. Picks a campsite right by the lake
7. Washes right in the lake
8. Builds a big fire to cook dinner, using limbs from a live tree to build it

First Visitor (wakes up and sees the Impact Monster): "Hey what's going on?" Visitor goes down to the lake to talk to the Impact Monster. "Did you make this mess? (Very disturbed): Oh no, the snake's dead, the flowers have been killed ... "

The Impact Monster: Me? No, I didn't do this ..."

The visitor chases the Impact Monster, shakes him or her and then begins to talk about the proper way to camp and behave in the wilderness.

Narrator: Talking with the Impact Monster, the visitor explained why a person should camp away from the lake, why using branches to build a fire damages the environment, and how being quiet helps you see more wildlife. The Impact Monster now not only knows how to be a good camper, but *wants* to be a good camper. They camp together that night ...

As they sleep through the night,nocturnal animals roam and hunt their food, the stars move across the sky, and the sun finally rises in the morning sky.

Our wilderness visitors eat breakfast, pack up, look around their campsite, and pick up some trash left behind from other campers. They walk back down the trail, arrive at their cars, and prepare to travel home.

> [What new ways of thinking is the Impact Monster going to take back from this journey in the Wilderness? What will the Impact Monster remember, and what can it apply to life in the city?]

Evaluation:

It's good to wrap this up by explaining that people need to be considerate of all the other creatures in the wilderness and behave in ways that are not unlike the ways we behave in our own homes. The metaphor of "home" can be used to advantage—the wilderness is a home to many creatures, and we must take care of it.

Credit: ***Environmental Interpretation: A Practical Guide for People with Big Ideas and Small Budgets***, by Sam H. Ham. This version was provided as a case study to Sam H. Ham by Mary Beth Hennessy; Pike San Isabel National Forest

Activity 2: Soft Paths

Background:

Use Soft Paths video as a follow-up activity to the Impact Monster skit. The script is written for a general audience, and some concepts may be difficult for elementary students. However, elementary age children are included in the scenes, and so they can enjoy watching backpackers and thinking about ways to reduce their impact to the land.

Materials:

Soft Paths video

VCR and monitor

chalkboard, chalk

Teacher Information page, ***Soft Paths*** discussion questions (Page 197)

Procedure:

1) Ask students to explain what they think "Leave No Trace" techniques are. List on chalkboard.

2) Explain to students that they will watch a video that explains low impact camping techniques by two different groups of backpackers: One party visits a popular, heavily used area. Drew and Abbey are the leaders and they travel on established trails. A second group, led by Annie and John are traveling in a backcountry, pristine area, traveling cross country where there are no trails.

3) View the ***Soft Paths*** video with students.

4) Make a chart on the board. Divide your chart in two halves. Title one half "Popular, Heavily Used Area" and the other half "Pristine, Trailess Backcountry." After viewing the video, ask students for suggestions to complete the chart. Make sure students understand the difference between the two groups and what "Leave No Trace" techniques should be practiced in each area.

5) Make up your own discussion questions or use the questions that accompany this activity.

Extension:

- Students can create their own skits delivering the "Leave No Trace" message.

Evaluations:

Ask students to set up a "Leave No Trace" camp in your school yard, park, natural area, or wild place. Evaluate camp to see if "Leave No Trace" camping techniques were put in use.

After viewing "Soft Paths" video, ask student to explain appropriate behaviors in front country (on trails) and appropriate behaviors in the back country (off trail). Why are there different behaviors in different areas?

Sometimes the rare, the beautiful can only emerge or survive in isolation. In a similar manner, some degree of withdrawal serves to nurture man's creative powers. The artist and scientist bring out of the dark void, like the mysterious universe itself the unique, the strange, and unexpected.

—*Loren Eiseley*

SOFT PATHS DISCUSSION QUESTIONS

1. When you travel in the backcountry what is the most important thing you can carry with you?

Possible response:

Good judgement.

2. What are some of the important things to think about when you travel in wilderness?

Possible response:

There are no hard and fast rules. Flexibility is important. You need to know about:

- where to hike
- where to camp
- how to take care of waste
- whether or not to build a fire
- different environments require different hiking and camping practices

3. On your chart, list the important considerations of the group led by Drew and Abbey. Were they traveling and camping in a popular, heavily used area?

Possible response:

- concentrate use in popular spots already showing impact
- stay on the main trail, don't cut switch backs
- when you select a campsite, choose one that has already been established
- camp away from water sources
- use lightweight stoves instead of campfires
- if you build a minimum impact fire, use an existing campfire ring, gather dead wood lying on the ground, and make sure the ashes in your campfire ring are cold before you leave.

4. On your chart, list the important considerations of the group led by Annie and John who are in a backcountry, pristine area, traveling cross country where there are no trails.

Possible response:

- leave minimal traces of your passage, spread impacts in pristine area
- avoid wet meadows and soils, and steep, unstable slopes
- travel on snow or rocks
- when selecting a campsite, find a place not camped on before, one that's durable like a sandy bottom or rocky outcroppings.
- use lightweight stoves instead of campfires
- avoid camping in places where impact is just beginning and scatter remains of old camp fire rings

5. What are some of the other general practices whether you're in a popular, heavily used area or in a trailless, backcountry area.

Possible response:

- pack your food in lightweight plastic bags and eliminate excessive packaging
- pack all food scraps out as garbage
- if you pack it in, pack it out
- wash yourself away from camp, at least 200 feet from water sources, preferably using no soap or use biodegradable, phosphate-free soap
- bury human waste away from camp and water sources, using cat holes
- leave what you find (wildflowers, rocks, bones, etc.)

6. Can Wilderness survive humankind?

Possible response:

Answers may vary.

Lesson 5: Wilderness Decision-Making and Group Dynamics

Objectives:

- Students will understand that good decisions lead to self-reliance in wilderness.
- Students will recognize that group members take on different roles in making good group decisions.

Background:

"When information is incomplete and knowledge uncertain, analysis must give way to judgment as the driving force of decision-making. Complex decisions [in wilderness] rarely yield to "correct" answers or solutions." (Drury and Bonney, 1992). Judgment is the accumulated wisdom we glean from past experience and apply to present problems. In wilderness, there are always many factors to consider in order for a group to accomplish its goals safely. Sound decisions based on good judgment are essential for successful travel. Learning how to learn from experience is the process of acquiring good judgment, and it can start with elementary students.

Most decision-making on wilderness trips is done cooperatively. It's the "two heads are better than one" idea. People have different experiences and strengths, and if a group can find a way to use its members' strengths, it is more likely to make good decisions. But group dynamics are complex, and sometimes decision making can be greatly inhibited by communication problems, hurt feelings or unresolved power struggles.

The activity included here has been used in group dynamics awareness and outdoor leadership training for many years. This version is adapted from Phipps (1991). The purpose is to begin to build students' awareness of the complexity of decision-making in wilderness, and the ways that groups work together to reach a group decision.

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary Skills), Page 185
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: Lost in the Wilderness

Materials: Ideally, one copy of the Individual Worksheet per student (on p. 202 following this lesson)

Procedure: 1) Have students sit in a circle facing each other. Read the narrative of "Lost in the Wilderness" from the Student/Teacher Information Sheet at the end of this lesson. Explain to students that in order to rank order the items that the group has compiled it will be necessary to decide whether to stay at the plane or try to hike out. One rule is that they must all stick together.

2) Ask students to silently and individually rank order the items on the individual worksheet according to their importance for your survival. If copies of the worksheet are not possible, write the list on the blackboard before the exercise begins and ask students to copy the list onto their own paper.

3) After all students have individually ranked the items (they may need to hear parts of the story over again as they deliberate their decisions), ask students to discuss their rankings until they all agree on an order. Allow adequate time for this. It may take up to 30 minutes.

4) Finally, debrief. Remember that finding the *right* answer is not the real issue. Rather, the *process* of reaching the decision and the *strategies* that are involved in trying to survive provide the real learning. The following discussion questions might guide the debriefing:

How sure are you that the group made the best decisions possible?

How sure are you that everyone agreed?

What else would you have wanted to know in order to be certain you were doing the right thing?

What role did you feel you played in the group? (Leader, follower, helper, silent partner, etc.) Do people sometimes play more than one role in a group? Can they?

Would you want to be lost in the wilderness with this group?

Is group consensus always the best? What would the group do?

Credits: The activity was taken from Phipps, M. (1991). Group dynamics in the outdoors. In Cockrell, D. ***The Wilderness Educator***. Merrillville, IN: ICS Books.

Another good discussion is found in Drury, J. and Bonney, B. ***The Backcountry Classroom***. (Merrillville, IN: ICS Books, 1992).

Extension:

- A recent arrival on the scene is Politano, Colleen. ***Lost in the Woods.*** (Merrillville, IN: ICS Books, 1993). This is a wonderful children's book about a boy who becomes lost and survives a night alone in the woods.

Evaluation:

- Assign students to write an essay describing their survival story. Ask them to explain the rationale behind their equipment selections. What short-term and long-term impacts have they left in wilderness? Can the impacts be restored or rehabilitated?

LOST IN THE WILDERNESS

Your expedition was flying across a remote wilderness in a small private airplane. You were on your way to a trailhead to climb a peak. As you were flying through a big storm, the plane's engines suddenly started to sputter and die, and the plane began to lose altitude. Finally, the pilot was able to crash-land the plane on its belly in the snow. The rough landing tore off the plane's landing gear though, so there was no chance of taking off again even if they could fix the engines. In the wreck the electrical system was also destroyed, so there is no heat or lights.

With its emergency back-up battery, the radio is working, and over it you heard that the blizzard you flew through is a major one, and it's not expected to end until tomorrow night. Immediate clearing is expected then. Temperatures tonight are expected to plummet below zero with winds as strong as fifty miles per hour. The high temperature tomorrow is forecast as 10 degrees with winds unchanged.

You are not sure of your exact position. Your best estimate is that you are 35 miles from the nearest paved secondary road.

Your small private plane is standardly equipped with bucket seats in front and four back bucket seats with a storage area in the rear. All windows are glass.

In the storage area, you have the following things: Several magazines, a magnetic compass, a map of the immediate area, one pound of beef jerky, a first aid kit, a sheath knife, a shovel, several old pairs of blue jeans, two old blankets, and some hubcaps. Each of your party is wearing winter mountaineering boots, polarguard coats, good wind gear, mittens and hats, and you have a 12 gauge shotgun with shells. In your pockets you have some cash and assorted change. In the glove compartment are sunglasses (one pair per person) and assorted maps of the region.

In discussing your survival possibilities, your group has put together a list of 15 items that you have. Your next task is to rank these things from most important to least important for your survival, so that you will be sure to protect the really important items. Start by doing this on your own on the Individual Worksheet. Then try to talk about it as a group until you all agree about the rankings.

Note: Tailor the story to reflect local ecosystems.

Also, please note we are not promoting overflights over Wildernesses. Many planes take alternative routes or maintain a high altitude (at least 2000') to not disturb people and wildlife who may be in a Wilderness below.

LOST IN THE WILDERNESS

Individual Worksheet

Listed below are the 15 things your group found on the crashed plane. Your task is to rank them according to how important they are for your survival. Place the number "1" by the most important thing, the number "2" by the second most important, and so on, through the number "15", the least important.

____ Beef jerky
____ Blankets
____ Cigarette lighter
____ First aid kit
____ Gasoline
____ Hoses
____ Hubcaps
____ Rear view mirror
____ Knife
____ Magnetic compass
____ Map of the area
____ Shotgun
____ Shovel
____ Spare tire
____ Sunglasses

MIDDLE SCHOOL LESSONS

FOR 6TH-8TH GRADES

Middle

STRAND	OVERVIEW	AESTHETICS
GOAL	**To have basic knowledge of who preserves and manages Wilderness, why it is preserved and how.**	**To gain awareness of societal aesthetic values placed on wilderness through literature and art.**
OBJECTIVE(S)	Lesson 1 - Students will define and explain concepts or feelings they associate with wilderness. Students will demonstrate an understanding that wild lands are an important part of our national heritage and a source of pride for Americans. Students will locate the Wilderness in their state and know what percent of the land base these areas comprise. Lesson 2 - Students will know, identify and label the location and distribution of Wildernesses in the U.S. and their state. Students will compare and describe difference between Wildernesses.	Lesson 1 - Students will identify two perspectives of wilderness expressed through the media. Students will be exposed to current natural resource and wilderness issues. Students will evaluate the balance and fairness of information designed to represent points of view about wilderness. Lesson 2 - Students will be able to distinguish between beliefs or opinions, values, attitudes, and facts. Students will develop opinions about wilderness issues and explain reasons for their choices. Students will identify and assess the values and points of view regarding wilderness. Lesson 3 - Students will be able to create and use metaphors and similes to help them understand conditions, values and processes in Wilderness. Lesson 4 - Students will enrich their perspective of wilderness through age appropriate literature.
LESSON Activities	Lesson 1: Introduction to Wilderness (Page 209) Activity 1: Wild Words Activity 2: Wilderness Slide Show (General audience script) Activity 3: *Last Parable* (video) Lesson 2: Where is Wilderness? (Page 215) Activity 1:. National Wilderness Preservation System Activity 2: State Wildernesses	Lesson 1: Perspectives of Wilderness (Page 219) Activity 1: Media Messages Activity 2: What's News? Activity 3: Words About Nature (from *Green Scene*) Activity 4: Formal Format: Observation Series Activity 5: Wilderness Poetry Lesson 2: Where Do You Stand? (Page 227) Activity 1: Where Do You Stand? Lesson 3: Wilderness Values (Page 233) Activity 1: Wilderness Metaphors Activity 2: Wilderness Similes Lesson 4: My Side of the Mountain (Page 237) Activity 1: My Side of the Mountain

Middle

STRAND	PERSPECTIVES	ECOLOGY
GOAL	**To understand geological history, westward expansion, and the environmental preservation movement as perspectives on Wilderness.**	**To have an understanding of patterns, relationships, and natural cycles relating to healthy ecosystems.**
OBJECTIVE(S)	Lesson 1 Students will gain a perspective on Wilderness preservation represented by a timeline of geologic history. Lesson 2 Students will be able to describe and compare attitudes toward wilderness represented by different groups throughout the period of westward expansion in the U.S. Students will experience communication skills that may have been used by early wilderness travelers, in a creative map making activity. Lesson 3 Students will describe several principal personalities and their philosophies in Wilderness preservation history, form George Catlin and John Muir to Howard Zahniser and David Brower.	Lesson 1 Students will identify different parts of a skull and suggest associated adaptations. Students will gain an awareness of the relationships between these adaptations, habitats, and communities interactions. Lesson 2 Students will use keys and guides to identify some state wild species. Students will gain an awareness of their own abilities to investigate wildlife and natural features using these resources.
LESSON Activities	Lesson 1: Wilderness Time Line: The Long and Short of It (p.241) Activity 1: Landscapes Through Time Activity 2: Rocks Lesson 2: Historic Perspectives (Page 245) Activity 1: Through Historical Eyes Activity 2: Early Messages/Maps Without Words Lesson 3: Personalities and Philosophies in Wilderness Preservation (Page 253) Activity 1:- John Muir and His Legacy Activity 2: Wilderness Heroes and Heroines Lesson 4: Wild by Law (Page 261) Activity 1: Wilderness Cards Activity 2: In Your Own Words Activity 3: Citizen Action: The Wilderness Act (Green Scene)	Lesson 1: Skulls to Communities to Ecosystems (Page 265) Activity 1: Stories from a Skull Activity 2: Design an Ecosystem Lesson 2: Keys to Understanding (Page 269 Activity 1: Introduction to Keys Activity 2: Rocky Mountain Tree Finder Activity 3: For the Birds

Middle STRAND	ECOLOGY (continued)	CONNECTIONS
GOAL		**To become aware of the specific geographic connections between urban communities and Wilderness as well as management options for wild lands.**
OBJECTIVE(S)	Lesson 3 Students will be able to describe a series of specific interconnections between species in a community type. Students will recognize the role environmental factors plays determining community composition of different elevational life zones. Lesson 4 Students will define and illustrate the natural role of fire in wild ecosystems. Students will demonstrate and draw fire habitats and cycles as they relate to natural communities. Students will portray and recognize American Indian use of fire.	Lesson 1 - Students will simulate the effects of acid rain on Wilderness. Students will evaluate how acid might effect Wilderness and invent solutions. Lesson 2 - Students will demonstrate the relative scarcity of fresh water on the planet. Students will illustrate the basic concepts of the water supply cycle and understand the role Wilderness plays in preserving a continuous supply of fresh water. Students will understand the concept of a watershed and be able to identify one of a topographic map. Lesson 3 - Students will recognize and that there are many perspectives from which to view land management decisions. Students will define some of the challenges faced by land managers.
LESSON Activities	Lesson 3: Ecosystems (Page 277) Activity 1: Life Zone Study Groups Lesson 4: Fire's Role in Wilderness (Page 279) Activity 1: Habitats Classified Activity 2: Cycles Behind the Scenes Activity 3: Grandfather Fire	Lesson 1: Acid Rain and Wild Places (Page 287) Activity 1: Acid Rain Investigations Lesson 2: Water Cycles and Watersheds (Page 293) Activity 1: Bag of Water Activity 2: Water Cycles Activity 3: State Watersheds Lesson 3: Wilderness Management (Page 297) Activity 1: You Manage Activity 2: Stake It Out (from *The Green Scene*, with video)

Middle **STRAND**	**SKILLS**	**SKILLS** (continued)
GOAL	**To gain specific skills necessary for responsible and enjoyable backcountry travel and living.**	
OBJECTIVE(S)	Lesson 1 Students will understand common U.S. Geologic Survey map symbols including contour lines. Students will be able to use a compass to read bearings in the field and on a map. Students will be able to orient a map. Lesson 2 Students will be able to identify special nutritional requirements of wilderness travel, be able to light a backpack stove, and prepare several recipes.	Lesson 3 Students will identify the essential items of equipment for an overnight wilderness trip, including tents, sleeping bags, backpacks, stoves and cook gear, and be able to evaluate the quality of specific examples. Lesson 4 Students will understand the eight basic "Leave No Trace" principles of backcountry use, and be able to demonstrate specific techniques implementing the principles. Lesson 5 Students will describe the steps in the wilderness decision-making process, and apply them in a hypothetical problem in wilderness.
LESSON Activities	Lesson 1: Basic Map and Compass (Page 303) Activity 1: Map Symbols Bingo Activity 2: Reading the Land—Contours! Activity 3: What is a Compass? Activity 4: Bearings with Map and Compass Activity 5: Triangulation with Map and Compass Activity 6: Map and Compass Use Lesson 2: Wilderness Nutrition and Cooking (Page 329) Activity 1: Nutrition and Wilderness Rations Activity 2: Stove Operation Activity 3: Stove Cookery	Lesson 3: Wilderness Equipment Selection and Use (Page 337) Activity 1: You Be the Judge Lesson 4: Leave No Trace (Page 341) Activity 1: Leave No Trace: Test Your Skills Activity 2: Skills Trail Activity 3: *Soft Paths* (video, 15 minute version) Lesson 5: Wilderness Decision-making (Page 347) Activity 1: Decision at High Mountain

OVERVIEW

Lesson 1: Introduction to Wilderness

Objectives:

- Students will define and explain concepts or feelings they associate with wilderness.
- Students will demonstrate an understanding that wildlands are an important part of our national heritage and a source of pride for Americans.
- Students will locate how many Wildernesses are included in their state and what percentage of the land base these areas comprise.

Background:

Rod Nash, wilderness historian, tells us that ***wilderness*** *is a difficult word to define. While the word is a noun, it acts like an adjective. There is no specific material object that is wilderness. There is no universal definition of wilderness. He believes that wilderness is so heavily weighed with meaning of personal, symbolic, and changing kind that it is difficult to define. Some American Indian cultures do not have a word for wilderness or see the need to protect land officially designated as Wilderness. They believe all land should be respected and all land is used only for survival, whether it be physical, spiritual or mental. If asked, we all have a different and unique definition for what wilderness means to us.*

These lessons are designed to introduce students to the idea of wilderness. The first activity is a word association game to encourage students to think about what "wild" and "wilderness" means to them. There are no right or wrong answers, and a discussion can help to open up a new world of thinking. The wilderness slide show provides opportunity to view units in the National Wilderness Preservation System. ***The Last Parable*** *is a beautiful elaboration of traditional American wilderness values and feelings. Wildlife, and its dependence on Wilderness and other wild lands for survival provides for a lasting impression.*

See Also:

- Introduction to Wilderness—(Primary-Overview), Page 47
- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity 1: Wild Words

Materials: Chalkboard, personal journal, or poster board, if you wish to save student definitions for later reference.

Maps

Procedure:

1. Ask students to write down all the words they associate with wilderness. Provide at least five minutes.

2. Ask students to define wilderness in one to three words. Record responses on poster board or chalkboard.

3. Help students see there are many different definitions for wilderness. We all may have a different personal definition for wilderness.

4. As a group or individual activity, assign students to read and discuss "Defining Wilderness" student information sheet (Page 211). Discuss the different definitions and perceptions people have had about wilderness. Explore the feelings associated with words. Ask, how does the word make you feel? What are some things you do that are wild? Are cities wild?

5. Ask students to write a short story using as many of the words on the board as possible, or they can just use their own definitions.

6. Use a national forest or state map from the wilderness box to point out wilderness in your state. Examine map from the brown accordion folder in the trunk. Locate Wilderness in other states and regions. Does each state in the United States have Wildernesses?

Evaluation:

Evaluate short stories students write about wilderness.

Using maps, ask students to locate Wilderness in their state, around the country.

The fairest thing we can experience is the mysterious. It is the fundamental emotion at the cradle of true art and true science. He who knows it not is as good as dead, a snuffed-out candle...

—Albert Einstein

DEFINING WILDERNESS

Rod Nash, wilderness historian, tells us that **wilderness** is a difficult word to define. While the word is a noun, it acts like an adjective. There is no specific material object that is "wilderness." There is no universal definition of wilderness. He believes that wilderness is so heavily weighed with meaning of personal, symbolic, and changing kind that it is difficult to define.

In early Teutonic and Norse languages, from which the English word developed , the root word, "will" meant "self-willed, willful, or uncontrollable." From "Willed" came the adjective "wild" used to convey the idea of "being lost, unruly, disordered or confused." Applied initially to human conduct, the term was extended to wildlife or wild animals as "being out of control of man." Other Europeans defined wilderness as "deserted places" and "lacking of cultivation." The idea of a habitat of wild beasts implied the absence of men, and wilderness was conceived as a region where a person was likely to get into a "disordered, confused, or 'wild' condition."

Even in today's dictionaries, wilderness is defined as uncultivated and otherwise undeveloped land. The absence of men and the absence of wild animals is a common, modern-day perception. The word also designated other non-human environments, such as the sea and, more recently, outer space. The usual dictionary meaning of wilderness implies "hostility on man's part," but the term has also developed positive meanings. On one hand wilderness is "inhospitable, alien, mysterious, and threatening." On the other, "beautiful, friendly, and capable of elevating and delighting us."

Today some define wilderness as a sanctuary in which those in need of consolation can find respite from the pressures of civilization. **Bob Marshall**, champion for Wilderness, demanded an area so large that "it could not be traversed without mechanical means in a single day." **Aldo Leopold**, Wilderness visionary, set his standard as an area's ability to "absorb a two weeks' pack trip."

A century-old movement to protect wild country reached it's peak moments in time with the creation of a National Wilderness Preservation System, passed into law by Congress as the Wilderness Act of 1964. According to it's authors, the Wilderness Act defined wilderness, "in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain." The act went on to require that a wilderness retain "its primeval character and influence" and that it be protected and managed in such a way that it "appears to have been affected primarily by the force of nature." Some Native American cultures do not have a word for wilderness or protect land as officially designated Wilderness. They believe all land should be respected and all land is used only for survival, whether it be physical, spiritual or mental. If asked, we all have a different and unique definition for what wilderness means to us.

Credit: ***Wilderness and the American Mind,*** Roderick Nash, Yale University Press, 1982.

OVERVIEW - MIDDLE

Activity 2: Wilderness Slide Show

Materials: **Wilderness Slide Show**

Slide script (in brown folder)

Procedure: 1. Read the slide show introduction of the script. Plan at least 30 minutes for the program so you will be able to proceed slowly, answer questions from students and permit time for students to digest and discuss their perceptions. A question worksheet is included with script.

2. Ask students to choose or compose music to accompany the slide show.

Activity 3: The Last Parable (Video)

Materials: ***The Last Parable*** video

VCR and monitor

dictionary

Teacher Information page, ***The Last Parable*** discussion questions

Procedure: 1. Complete the "Wild Words" activity and watch the Wilderness Slide Show as prerequisite student background information before conducting this activity.

2) Ask students to look up definitions in a dictionary for these words: myth, legend, story, and parable

3) View ***The Last Parable*** video with students.

4) Make up your own discussion questions or use the questions that accompany this activity.

Extension:

- "Wild Words" can be extended by creating a "word web," spatially connecting the words that students generate on the board, with descriptions of their connections and relationships. After seeing ***The Last Parable***, consider returning to the words generated in Wild Words. Ask the students if any of their feelings about these words have changed. What words would the wilderness travelers in the video have used to describe wilderness?

Evaluation:

Evaluate short stories students write in Activity one: Wild Words.

Use discussion questions as an evaluation of what students have learned about wilderness and wildlife.

THE LAST PARABLE DISCUSSION QUESTIONS

1. Why do you think the video was called, "The Last Parable"?

   Possible response:

   Answers may vary.

2. How do humans and nature grow apart?

   Possible response:

   As we grew more civilized, we lost the "sense of wonder" through modern science and civilization of towns and cities.

3. Where would the unicorn live and why?

   Possible response:

   The unicorn would need to range freely, far away from any community where there are no sounds of cities or machines, densely forested mountains, possibly in Wilderness or wild lands. The unicorn symbolizes wildness and freedom.

4. List at least 10 wildlife species viewed in the video.

   Possible response:

   -sage and sharp tailed grouse
   -coyote
   -badger
   -golden eagle
   -mule deer
   -grizzly bear
   -great blue heron
   -mountain goats
   -water ouzel
   -moose
   -trout
   -trumpeter swan
   -pronghorn antelope
   -elk
   -fox
   -Canada goose
   -whitetail deer
   -black bear
   -cedar waxwing
   -bighorn sheep
   -river otter
   -bald eagle
   -wood ducks

5. Explain how you felt when you watched the grizzly bear chase down the elk calf.

   Possible response:

   Answers may vary

6. How did/do American Indians view grizzly bears?

Possible response:

They viewed the bear as a being of immense power, they honored the bear, conducted ceremonies, and viewed the bear as a symbol of wilderness and wildness

7. What does the grizzly bear symbolize to you?

Possible response:

The narrator in the video suggests that we (humans) are no greater than any other creature, that we are vulnerable, The bear reveals our morality, and that we are in need of its power.

8. Describe the connection between saving wildlife like bears and saving wild places.

Possible response:

Answers may vary

9. Write a response to these words:

If wild places, and wild animals like elk, trout and bear are lost, we may not be able to find our way home, and the universe will mourn the last parable.

Possible response:

The wilderness and the wildlands, both myth and reality combine as a parable—offering us a useful truth—offering clear and eloquent clues to the meaning we seek for out lives and times. If wilderness is lost, that meaning may be lost, then the universe will mourn the last parable.

Lesson 2: Where Is Wilderness?

Objective:

- Students will know, identify and label the location and distribution of Wildernesses in the US and their state.
- Student will compare and describe differences between Wildernesses.

Background:

The National Wilderness Preservation System includes federally designated Wildernesses within National Parks, Forests, Fish and Wildlife Refuges, as well as Bureau of Land Management Lands. The following activities help to inform students of the location of Wildernesses in the US, and in their state. As you examine the maps, review the information learned in lesson one. Encourage students to question why these areas might have been established in these particular geographic locations, in terms of American history, topography, and cultural values.

The book **American Wilderness: 25 years** *provides an excellent resource for information about the features and history of Wildernesses in different regions of the US.*

See Also:

- Wilderness Act History—(Elementary-Perspectives), Page 127
- Personalities and Philosophies in Wilderness Preservation (Middle-Perspectives), Page 253

Activity 1: National Wilderness Preservation System

Materials:
National Wilderness Preservation System Map
"Nat. Wilderness Preservation System Map" worksheet
American Wilderness: 25 years

Procedure:

1) Briefly introduce the main features, color key, and symbols of the map.You may wish to address the maps with the whole class, *or* to combine this activity with the state map study so that different groups can work with maps at different locations of your classroom.

2) Distribute the National Wilderness Preservation System worksheet. Students may complete worksheets individually or as teams.

3) Review and discuss worksheets. Some thought-provoking questions might be:

- Where are the largest areas of Wilderness in the western US? Why do you think they are in this region?
- What is the relationship between this pattern and the location of large population sources?
- Are most of these areas in mountains or plains? Why do you think this pattern has developed?

Activity 2: State Wilderness Areas

Materials:
State Wilderness Map
State Wildernesses worksheet

Procedure: 1) Follow the same procedure as that described in Activity one, using the above materials and the "State Wildernesses Worksheet."

2) Questions specific to states are:

Note the closest Wilderness Area to your community. Can you see it from your school? Your house?

Why are there so few Wilderness Areas in some parts of your state? Is this a comment on what kinds of lands the public values? Federal land ownership patterns? Aesthetics? Lands used for agriculture? or other natural resource-based ways of making a living?

Extensions:

- Research Wilderness management in other countries.
- Research information on the passage of the most recent state Wilderness Act.
- Select another state that has Wildernesses, and complete the student worksheet.

Evaluation:

Name and locate five Wildernesses in your state. List total acreage, geographic location, and agency who manages each.

Grade state Wildernesses worksheet. Conduct pre and post tests using the worksheet.

I am glad I shall never be young without wild country to be young in.
Of what avail are forty freedoms without a blank spot on the map?

— Aldo Leopold

STATE WILDERNESS

Use the "State" map and "State Wilderness Status" map to answer the following questions:

Which color is used to designate Wilderness Areas managed by the

US Forest Service ____________________

National Park Service? ____________________

Where, in general, are most of the Wildernesses in your state? ______________

What is the landscape like in these places? ____________________________

Locate and name the nearest Wildernesses to your community. What is it called? Which agency manages it?

____

Can you see this Wilderness from your school? From your home? ______________

Imagine you are giving directions to someone else to tell them how to get there. What would you say? What other communities would you go through? Write a description or draw your own map.

Challenges:

If you were driving an average of 45 miles per hour, how long would it take you to get to the nearest Wilderness? ______________________

OVERVIEW - MIDDLE - WORKSHEET #2

NATIONAL WILDERNESS PRESERVATION SYSTEM MAP

Use the "National Wilderness Preservation System" map and information to answer the following:

On this map which color is used to represent Wildernesses managed by the

National Forest Service?____________________

National Park Service?__________________

Bureau of Land Management?______________________

Where in the U.S., in general, do you notice the most land designated as Wilderness?

____

Name some states that have more than 15 Wildernesses:___________________

____

Which state has the greatest number of Wildernesses?____________________

Which state has the largest total amount of acres in Wilderness?________________

Name a Wilderness that is in more than one state.______________________

What is the largest Wilderness in the US? Where is it?___________________

Smallest?____________________ Where is it?___________________________

What is the Wilderness that is farthest north in the US?___________________

east_________________, west_________________, south_______________

When were the first Wildernesses in your state established? (If there are two dates the earliest is when the area was first established and the later one is when land was added.)

____

Name one of these ________________________

Are there any Wildernesses that were established in the year you were born?

____

Choose a Wilderness you would like to visit. Record the following information:

State _____________________________ Year designated_______________

Acres_______________ Agency____________Public Land Unit_____________

(The public land unit is the specific organization within the agency that manages the Wilderness)

Why did you choose this Wilderness?

Why might it be an important area to preserve?

AESTHETICS

Lesson 1: Perspectives of Wilderness

Objective:

- Students will identify two perspectives of wilderness expressed through the media.
- Students will be exposed to current natural resource and wilderness issues.
- Students will evaluate the balance and fairness of information designed to represent points of view about wilderness.

Background:

From commercials for athletic shoes and sports cars with jagged mountains in the background, to advertisements for life insurance with photographs of families camping by a pristine lake, images of wilderness often enter the awareness of students through the media.

Activity 1 encourages students to investigate the values and qualities represented by these images. In Activity 2 students collect information about current issues involving resource management, as they relate to their community, geographic area or the global environment. Activity 3 provides students with the opportunity to create poetry using wilderness as inspiration. In Activity 4 students expand wilderness writing in a journal format, and wilderness poetry further expands upon writing done in Activity 3, Words About Nature.

See Also:

- Natural Resource Values—(Elementary-Aesthetics), Page 111
- Where Do You Stand?—(Middle-Aesthetics), Page 227
- Wilderness Values—(Middle-Aesthetics), Page 233
- My Side of the Mountain—(Middle-Aesthetics), Page 237
- Wild by Law—(Middle-Perspectives), Page 261

Activity 1: Media Messages

Materials:	Magazines (ones that may be used to cut out examples)
Procedure:	1) Explain to students that they are going to look for images of wilderness in magazines, on television, and in their community to see what messages are portrayed. 2) In small groups or individually, have students search magazines for advertisements that show connections with wilderness through their photography, language, or graphics. For these purposes any undeveloped outdoor scene may be used as an example of 'wilderness.' 3) As students select examples they should consider the following: What product is being advertised? Does this product have a direct connection with wilderness use? (ie, hiking boots, backpacks, etc.) Why do you think the company chose this setting to advertise their product?

What part of the advertisement is promoted by a connection with wild places? Which qualities of wilderness correspond with the desired image created by it's association with wilderness?

Do these images and values reinforce the factual information about federally designated Wilderness presented in other lessons? Do these images and values portrayed by the media represent or influence your personal perspective of wilderness?

Evaluation:

Have students look for allusions to wilderness and representations of wild places on television and in other media. Share and discuss these images and the qualities of wilderness they represent. Students should find at least six examples.

Activity 2: What's News?

Materials: TV reports, periodicals, newspapers, radio reports.

Procedure: 1) Begin by sharing ideas about how we gain information, focusing on the use of media, newspapers and periodicals. In this activity students are to collect news reports about issues related to resource management in general and, if possible, wilderness specifically. This may best be done as a homework assignment.

2) Have students bring in current newspaper or magazine clippings. They may also make written descriptions of reports they hear in radio or TV reports.

3) Some points for discussion are: What issue or topic is being addressed? Does the report represent several viewpoints or only one? Is there an evident 'bias' presented by the reporter? Is the issue controversial? Did the report sway your views on the issue. What is your viewpoint? Is there more information you would like to know about this topic?

Extension:

- Have students look for wilderness images or references in other contexts: Clothing brand names, names of stores and businesses, etc., keeping in mind that many of these examples may have no evident connections.
- An extension of *Media Messages* and *What's News?* activities is to allow students to take the completed collages (without titles on them) into another class, and ask the new class to give titles to the collages. Having other kids identify the same images and stereotypes reinforces the reality of these shared experiences with nature.
- Also an extension mentioned in ***Words About Nature*** is to have students write television commercials about the natural world using persuasive communication, and then act out the commercial. *Would you buy a wilderness experience from this man or woman?*

Evaluation:

Working individually or in small groups, students can design a media report portraying all sides of a controversial issue regarding natural resource management.

Activity 3: Words About Nature (from The Green Scene)

Materials:

Words About Nature from ***The Green Scene*** curriculum located in the brown accordion folder in the Wilderness Box.

One copy for every four students of each of the following handouts included with "***Words About Nature***."

Team Writing

Poem Analysis

Poems: Haiku or Free Verse or Poems that Rhyme or Tree Poems (Your choice!)

Presidential Quotes

Quote Analysis

Pens

Journals (optional)

Procedure:

1. Begin by explaining the three purposes of language examined in this activity; Students are to:

1) communicate information;

2) to convey experience; and

3) to convince and persuade.

The activity examines these three applications of language to communication about wild nature.

2. Conduct the Team Writing, Poem Analysis, and Quote Analysis activities explained in this lesson. You may want to integrate use of the **journal** into this lesson. It could be the "work table" for constructing the team writing paragraphs, or a place for all students to answer the questions in the poem and quote analysis.

Activity 4: Formal Format: Observation Series

Background:

Here's a word from Ken Norris, Professor of Natural History at the University of California Santa Cruz: "I want you to try out a format that has been very useful to me as a field naturalist throughout my career. It's very simple but it keeps thing straight, and causes me to put down important information that I might otherwise forget. My notes are now so precious that I think they are about the first thing I would sling out the window if the house caught on fire. I have them all bound and lined up on my shelf—a lifetime of experiences, friends, neat places, sensations, thoughts, observations, travels, triumphs, and touching the stars."

This lesson will introduce students to formal field journal format. It is by no means meant to stifle *creativity, but to introduce a method which is used by field ecologists, biologists, geologists, all the other "ists" and even some folks who just like a little more structure in their journaling.*

Materials: Pen
Journal
Example Observation Series Student/Teacher Information Sheet

Time Estimate 10 minutes to introduce format, 20 minutes for Observation Series

Procedure: 1) Perhaps read the above quote and describe the following format to students: (example field notes on Pages 225 and 226) It might be helpful to draw a piece of paper on the board and go through the format as a group or hand out the student/teacher information sheet example.

a. **Heading Centered -** at the top center of the page, write Journal, Class Notes, Field Notes,or Observation Series

b. **Heading Left -** Name, initials

c. **Heading Right -** Date

d. On the first line of the page, write the locality, starting with the largest geographical unit, next smaller, next smaller, precise locality. All should be underlined with a squiggly line.

e. **Left Margin -** The time (24 hour clock). Lines should be drawn along the left margin and along the top line.

f. **Upper Right Corner -** Page number

g. The text begins here. It is a good idea to describe the weather. Temperature, winds, precipitation all have a lot to do with what one may observe in the field.

2) Practice the format by doing an Observation Series:

- Have students write Observation Series at the heading center.
- Go through the remaining format, asking for volunteers for geographic location, weather, etc.
- Have students go outside or pick an object inside to observe (perhaps ask them the day before to bring in a natural object from home)
- Now, tell them to put down their journals and observe (without talking) what they have chosen (clouds, pine cone, bird) for 10 minutes.
- After the 10 minutes of observation is over, ask students to write for 10 minutes, describing what they noticed. Encourage diagrams or other pictures, and much detail. (color, size, behavior, etc)

Credit: Format directions adapted from ***Natural History Field Notes,*** by Ken Norris.

Evaluation:

Have students take class notes using this format.

Suggest that students do an Observation Series at home, or on a field trip.

Activity 5: Wilderness Poetry

Background

A fun way to utilize a journal is to write poetry. Much of the wonders of the natural world have been recorded in this art form. This activity introduces four poetry styles: Haiku, Cinquain, Picto-Poem, and Vertical Poems. You can encourage students to write poetry in their own unique styles as well.

Materials: Pen or pencil
Journal

Procedure: 1) Describe the four different poetry styles listed here:

How to write a Haiku: The Haiku has 17 syllables in three lines. Two lines have 5 syllables each, and one line has 7 syllables.

Example:
Giddy grasshopper
Take care...do not leap and crush
These pearls of dew drops

How to write a Cinquain:
Line one: Name the subject (one word). Line two: Describe the subject (two words). Line three: Tell what the subject is doing (three words). Line four: Tell how you feel about the subject (four words). Line five: Rename the subject (one word).

Example:
Aspen
Slender sentinels
Cloning, reaching, bending
Community spreading from one
Survivors

How to make a Picto-Poem: Make a simple drawing of your theme. Arrange the describing words in the shape of your subject.

Example:

"Lightning"
Lightning
Streaking
Flashing
Splitting the
Skylike
Brilliant
Daggers!

2) Another fun poem activity is to take a word, such as WILD, write it vertically, and then create a line beginning with each letter from the word:

Water freezes
Ice fills cracks and holes
Lifetime of growth
Decomposed in minutes

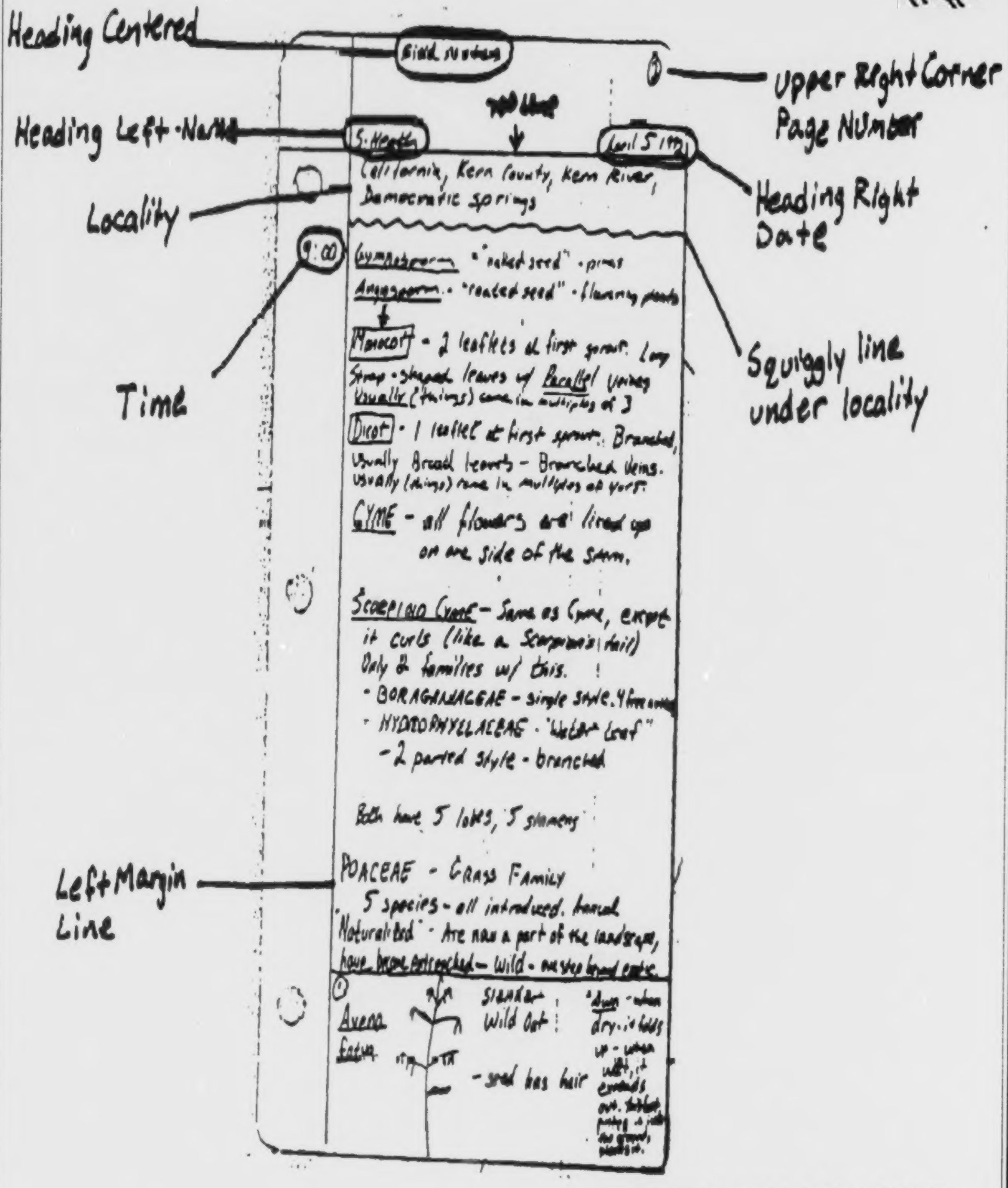
3) After practicing these styles as a group, ask students to try one (or their own style if they wish) on their own. Use ideas sparked from the Wilderness and Land Ethic Box activities.

Credit: Directions for the first three poem styles are from ***Keystone Science School Journal***, *1992.*

Evaluation:

- Ask students to define the four poetry styles.
- Encourage students to publish their poetry in student publications.

> *Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts.*
>
> *There is symbolic as well as actual beauty in the migration of the birds, the ebb and flow of the tides, the folded bud ready for the spring.*
>
> *There is something infinitely healing in the repeated refrains of nature - the assurance that dawn comes after night, and spring after the winter.*
>
> *—Rachel Carson*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Left Margin Line

Field Notes 1

S. Heath April 5 19[illegible]

California, Kern County, Kern River, Democratic springs

9:00 Gymnosperm - "naked seed" - pines

Angiosperm - "coated seed" - flowering plants

Monocot - 2 leaflets at first sprout. Long strap-shaped leaves w/ Parallel veins Usually (things) come in multiples of 3

Dicot - 1 leaflet at first sprout. Branched, Usually Broad leaves - Branched veins. Usually (things) come in multiples of 4 or 5.

CYME - all flowers are lined up on one side of the stem.

Scorpioid Cyme - Same as Cyme, except it curls (like a Scorpion's tail) Only 2 families w/ this.

- BORAGINACEAE - single style. 4 [illegible]
- HYDROPHYLLACEAE - "Water Leaf" - 2 parted style - branched

Both have 5 lobes, 5 stamens

POACEAE - Grass Family
5 species - all introduced. hence "Naturalized" - Are now a part of the landscape, have become entrenched - wild - one step beyond exotic.

1 Avena fatua Slender Wild Oat - seed has hair "Awn - when dry, it folds up - when wet, it extends out. [illegible]

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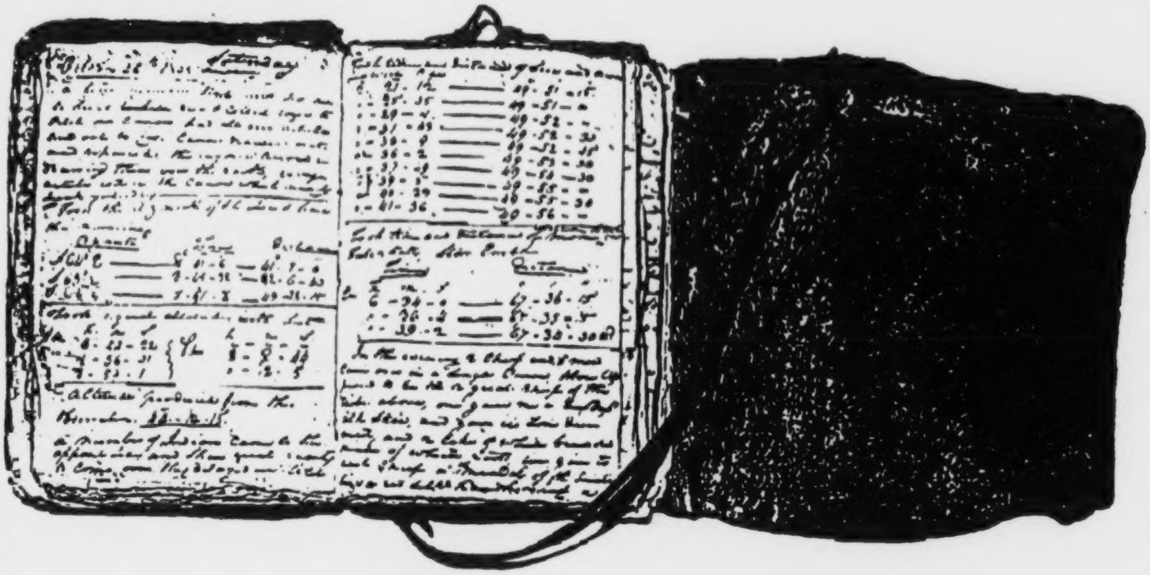
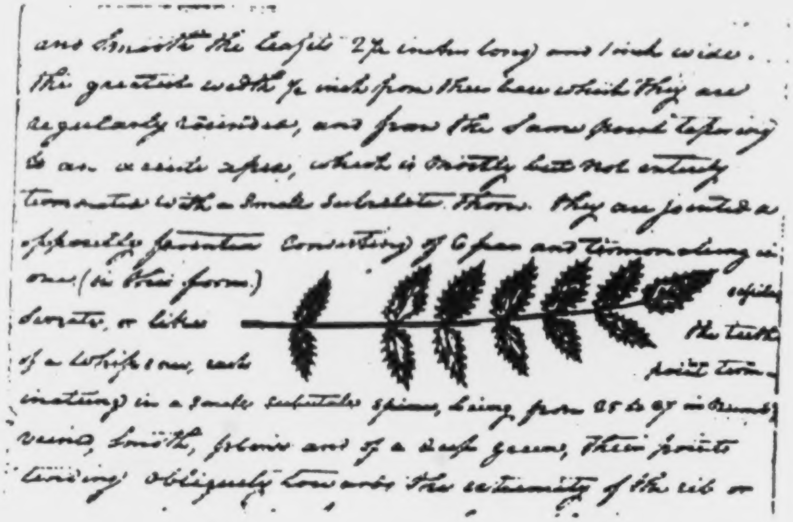
This notebook, bound in elkskin, is one of the original journals kept by Lewis and Clark. The entry for the 26th of October, 1805, contains several columns of figures recording the positions of the sun and moon—the explorers way of determining their exact location.



Clark's description of an Oregon grape leaf growing along the Pacific Coast included measurements down to a fraction of an inch.



and Smooth the leafets 2½ inches long and 1 inch wide.
the greatest width ½ inch from their base which they are
regularly rounded, and from the Same point tapering
to an accute apex, which is mostly but not entirely
terminated with a Small Subulate thorn. they are jointed a
oppositely pinnate Consisting of 6 pair and terminating in
one (in this form) [illegible]
Serrate, or like the teeth
of a whipsaw, each point term-
inating in a Small Subulate Spine, being from 25 to 27 in number
veins, Smooth, plain and of a deep green, their points
tending obliquely towards the extremity of the rib or

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Lesson 2: Where Do You Stand?

Objectives:

1. Students will distinguish between beliefs or opinions, values, attitudes, and facts.
2. Students will develop opinions about wilderness issues and explain reasons for their choices.
3. Students will identify and assess the values and points of view regarding wilderness.

Background:

Many attitudes about wilderness are based on personal values, experiences, and opinions. This activity encourages students to become aware that opinions are seldom "black or white" and that specific situations and circumstances can cause people to modify their opinions. Teachers should stress there are no right or wrong opinions about the statements that will be used. Opinions based on logic, emotions, or philosophy are valid, as long as they are not based on incorrect information. Individual students will never be evaluated based on their opinions.

It is difficult at times to discern fact from opinion, objectivity from subjectivity, and accuracy from exaggeration. Sometimes people are knowingly selective in what information they present about a topic. Other times they do not realize that they are presenting only a narrow view of the topic and that the way they see the world is not the only possible way.

Individuals in a community may hold differing beliefs or opinions, attitudes and values towards wilderness and land ethics. There are many different reasons for any beliefs, values and attitudes people hold. Whatever the reasons or sources, the result may be strongly held differences of opinion related to the same issue in the same community.

Sometimes the best solution to a local issue may seem obvious. More often, there are no clear "right" or "wrong" answers, yet emotions may be aroused and different "solutions" may have dramatically differing impacts on all involved, including wilderness.

For the purposes of this activity, the following definitions are given:

***Fact:** A piece of information presented as having objective reality, something that has actual existence.*

Example: 4% of the land mass of the United States is congressionally designated as Wilderness.

***Belief or opinion:** An information-based assumption. It may be right or wrong.*

Example: The more Wilderness we have, the more predators there will be.

***Value:** A worth attached to some event, place, idea, etc.*

Example: It is important to preserve wilderness.

***Attitude:** Based on an implied belief system, an implied value system, with a predicted behavior.*

Example: We need to protect all remaining roadless lands in Montana as Wilderness.

This statement implied a belief that it is more important to leave roadless lands undeveloped than to open them up to multiple-use development.

OR

We have enough land set aside as Wilderness, and we should open all remaining roadless lands in Montana to multiple-uses such as mining, road building, logging, and motorized recreation.

This statement implies a belief that natural resource development in roadless lands will provide economic benefits in the form of jobs and fewer restrictions on the types of recreational opportunities allowed.

***Interest Groups**: Those individuals or groups that have an interest in an issue, for personal, ecological, or economic reasons. They may or may not have much information, and may or may not have a strong opinion.*

***Wilderness**: An area where the earth and its community of life are not controlled by people, where natural forces prevail, and people may visit but not live permanently.*

***Land ethic**: A value position that depends upon an understanding of the science of ecology and the relationships among the parts of ecosystems. It also incorporates the belief that human beings are just one part of a larger earth community of plants, animals, water, soils, collectively called "the land." Living things are viewed from the perspective of populations rather than individuals and should be maintained in good health. Aldo Leopold believed, for example, that responsible actions would result if a person loved and respected the land.*

See Also:

- Natural Resource Values—(Elementary-Aesthetics), Page 111
- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Wilderness Values—(Middle-Aesthetics), Page 233
- My Side of the Mountain—(Middle-Aesthetics), Page 237
- Wild By Law—(Middle-Perspectives), Page 261

Activity 1: Where Do You Stand?

Materials: Discussion Guidelines; Teacher Information pages 231-232

Background:

When people disagree, it's hard to figure out who is right. You may decide one person is right just because the person is your friend or relative. But this is not a very good reason to agree or disagree with someone. It is better if you try to understand why these people disagree. On what main points do they disagree? Read or listen to each person's argument carefully. Separate the facts and opinions that each person presents. Finally, decide which argument best matches what you think about this process. Examining an argument without emotion is part of what critical thinking is all about. This is not easy. Many things make it hard to understand and form opinions. People's values, ages and experiences all influence the way they think. This is why learning to read and think critically is an invaluable skill.

Procedure:

1. Review the background information and definitions of beliefs or opinions, values, attitudes, and facts.
2. Discuss the differences between an argument and a discussion. Refer to "**Decision Making in a Nuclear Age**" (in text mentioned on Page 230) and "**Discussion Guidelines**" teacher information sheet (Page 231). You may also want to establish clear rules for behavior during class.
3. Put the following continuum on the chalk board:

Strongly Agree Strongly Disagree

4. Explain that you are going to read a series of opinion statements. Ask, "If you were to show your position on an issue, where would you be? Ask students to individually make 6 copies of the continuum on a piece of paper and place an "X" on the line after you read each opinion statement. If students have no opinion, or are somewhere between a strong feeling and neutral one, they can place their "X" accordingly along the line. Ask students why they placed their names where they did. Discuss the differing viewpoints in the class and why students hold these views. Encourage discussion and remind students that there are no "right" or "wrong" responses unless opinions are based on misinformation. If students feel comfortable sharing their opinions, ask them to come to the chalkboard and write their name on the line.

Use the following example to clarify your discussion:

Opinion statement: Basketball is more fun than volleyball.

Opinion variation: The basketball court is outdoors and it is snowing, windy, and 30 degrees below zero.

5. Now complete the activity using the following Wilderness issues that are stated in opinion statements and variations. These opinion statements include examples of Wilderness management and values for which there is a wide range of opinions. If the majority of students have similar opinions about a statement, use variations of each opinion statement. This may cause students to change their position based on new information.

Opinion Statement #1: Trees should never be cut in Wilderness.

Opinion variation #1: An unusual tornado has touched down in a remote Wilderness. 60 acres of valuable timber have been blown down. The nearest community is experiencing 90% unemployment. Several families could benefit from the income that could be brought in from collecting this already downed timber. They will use horses and not construct roads or use motorized equipment.

Opinion statement #2: Ski areas should be allowed in Wilderness, so long as the lifts and buildings are not within Wilderness boundaries.

Opinion variation #2: The ski runs will cut through important winter elk habitat. Human recreational use will present a disturbance to other wildlife wintering here as well. Maybe there's a more suitable place for a ski area outside designated Wilderness that could better meet the needs of skiers.

Opinion statement #3: It is important to preserve all remaining roadless lands in the United States through Wilderness designation.

Opinion variation #3: Wilderness designation should allow grazing, mining, or timber harvest. Recreation with motorized vehicles should also be allowed.

Opinion statement #4: All people should have equal access into Wilderness.

Opinion variation #4: Imagine a particular Wilderness where there is a cultural ceremonial site that has been used for many generations by American Indians. The area is now being destroyed by the impacts of non-American Indians who come here to camp and seek spiritual experiences.

Opinion statement #5: Insect infestations are a natural process and should be allowed to occur within Wilderness ecosystems.

Opinion variation #5: A large scale bark beetle infestation in a Wilderness is spreading rapidly and nearing the boundary of a large commercial tree farm with the same tree species.

6. Discuss how additional information might have caused students to change their responses to different opinion statements. Make a list of factors influencing student's opinions, such as personal experiences, occupations they are interested in or family background.

Credits: The framework and concept for this activity are credited to " **Wetlands & Wildlife**"; Alaskan Wildlife Curriculum, Alaska Department of Fish and Game and the U.S. Fish & Wildlife Service. It is therein credited to ***Project WILD***.

Decision Making in a Nuclear Age, Chris Austill, ed.

What Do You Think?: Teaching Critical Thinking on Critical Issues, Susan Williams

Extensions:

- Have students write their own opinion statements and variations and repeat the activity.
- Students could use these opinion statements, as well as their own, to compile questionnaires to collect and graph responses from other students or members of their community.

Evaluations:

Evaluate students ability to respect differing viewpoints after presenting discussion guidelines and completing the activity.

Grade class participation, ability to discern differences between facts and opinions, and completion of activity.

Everybody needs beauty as well as bread, places to play in, where nature may heal and give strength to body and soul.

-John Muir

DISCUSSION GUIDELINES

The following chart, taken from ***Decision Making in a Nuclear Age***, Chris Austill, ed., could be given to students to set guidelines for the discussion:

Argument	Discussion
Loud, angry, harsh tone	Quiet, calm, even tone of voice
Interrupting	Letting the other person finish a point before you start to speak
Changing the subject, using phony issues	Sticking to each point until you've worked through it
Insults, put-downs, sarcasm	Treating the other person with respect
Exaggeration (terrible, evil, everybody, always)	Using careful, exact words
Pushy or threatening body language	Using calm face and hand motions
Talking fast, rushing	Taking time
Thinking only of your next point instead of listening to the other person's idea	Listening carefully and seriously considering the other's views
Faking it if you don't know something, never admitting the other person has a good point	Saying "I don't know" if you don't, agreeing with the other person's good points
The goal is to win	The goal is to find the truth
Playing the victim to make the other person feel guilty	Being clear and assertive about the situation
Mind reading, telling the other person what he/she thinks or feels	Asking the other person how he/she feels

DISCUSSION GUIDELINES

1. Try to ask open-ended questions with no right answers; accept opinions, analysis of facts and arguments.

2. Allow time for students to think—"wait time"—before they answer.

3. Teacher should paraphrase, clarify, summarize points periodically, make it clear to the class where the discussion has been and can go.

4. Encourage student-student discussion by asking rebound questions, sending paraphrased answers back to students or to another student. Use questions like:

> Is that what you mean? (to first student)
> What do you think? Do you care to respond? (to new student)
> Who agrees? Disagrees? Wants to rebut? (to class)
> Who can explain why he/she might think that way?

Rebound questions require good listening skills on the part of the students.

5. Stay with a student long enough for him/her to develop a point. Redirect statements back to the same student for clarification, defense, explanation, etc. Try to guide that student further along in his or her thinking, rather than jumping immediately to next student.

6. Ask forced-choice decisions questions where students must take a position.

7. When necessary play Devil's Advocate in discussions to force students to support their own views. Be outrageous sometimes. That usually gets a response.

8. When students ask questions of the teacher, ask if other students want to respond before responding yourself.

9. Bring up value questions and/or moral choice questions in order to learn where you students stand on these. Explore these important issues with your students to find out where they are coming from, not to preach your point of view.

10. Accept all responses, correct them if facts are wrong, point out irrelevant or illogical information (or let other students do this).

From ***What Do You Think?: Teaching Critical Thinking on Critical Issues*** by Susan Williams.

Lesson 3: Wilderness Values

Objective:

Students will create and use metaphors and similes to help them understand conditions, values and processes in wilderness.

Background:

Thoreau wrote that:

> *"In wildness is the preservation of the world".*

Bob Marshall described his perspective of wilderness values in the following words:

> *"For me, and for thousands with similar inclinations, the most important passion of life is the overpowering desire to escape periodically from the clutches of a mechanistic civilization. To us the enjoyment of solitude, complete independence, and the beauty of undefiled panoramas is absolutely essential to happiness."*

The Wilderness Act states that these areas shall be "administered for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and enjoyment as wilderness."

Students may view wilderness in a variety of ways. There are a number of recognized reasons for its preservation. Wilderness has natural values that are vital to the health of our planet as well as the enjoyment of those visiting them. Activity 1 addresses some of these values through the use of metaphors. Activity 2 encourages students to make further comparisons between the functions of wilderness and aspects of their own lives through the use of similes. Background information is included in the "Wilderness Values" information sheet (Page 236).

See Also:

- Natural Resource Values—(Elementary-Aesthetics), Page 111
- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Where Do You Stand?—(Middle-Aesthetics), Page 227
- My Side of the Mountain—(Middle-Aesthetics), Page 237
- Wild by Law—(Middle-Perspectives), Page 261

Activity 1: Wilderness Metaphors

Materials:

large pillowcase, bag, or box
coffee filter
globe
candle
sponge
small bag of different coins
umbrella
sunglasses
egg beaters

Procedure:

1) Prepare the "Mystery Metaphor Container" using a pillowcase, bag or box by filling it with the listed materials, such that students may reach their hand in and pull out an object.

2) Share and discuss the **"Wilderness Values"** teacher information page.

3) Explain to students that metaphors offer a literary method of providing vivid images through direct comparisons between an object of idea, and

familiar objects. For example "They are a barrel of laughs" or "The sun was an orange ball on the horizon".

4) Tell students that everything in the container can be described as a metaphor that relates to wilderness.

5) Have students divide into small groups and individually take an item from the container. When each group has an object ask them to describe and demonstrate ways their object represents values or qualities of wilderness. Encourage students to build on each other's ideas. You can also assist by strengthening their connections. You may have additional ideas for items or for connections.

coffee filter - forests and plants *filter impurities* and pollutants in air

globe - preservation of wilderness is important as we learn more about the interconnections of life on *earth*

candle - Wilderness preserves natural systems, like *fire*

sponge - undeveloped wild lands provide watersheds that *retain water* resources and insure water quality

coins - *different values* of wilderness

umbrella - *protects* species diversity

sunglasses - different *perspective* of land management

egg beaters - Wilderness contains a *mixture* of species and communities

6) Allow students time to discuss their ideas and then share them with the rest of the class.

Evaluation:

- Ask each group to select five additional objects they can describe as metaphors to their classmates.
- Assign students to write an essay describing the values of wilderness.

Activity 2: Wilderness Similes

Materials: Notecards with one word from Similes List (see procedure)

Procedure: 1) Explain to students that similes make descriptions using 'like' or 'as' phrases.

2) Divide students into groups and give each group a card. Ask student to record all the ways wilderness is like the words on their card and then create their own similes. For example, "wilderness is like a living museum."

Words	Similarities to Wilderness
your backyard -	may have wild species, or places
a museum -	Wilderness helps to preserve geological and archaeological resources

your community-	different members of natural communities have different 'jobs'
adventure novel -	provides opportunity for undeveloped recreation
a bank safe -	Wilderness provides a sanctuary for species diversity
a pillow -	Wilderness provides a resting place away from noise and mechanization of populated areas

3) If you like, have students exchange cards and repeat the procedure. Have students create their own similes and comparisons.

Extensions:

- Review the "Wilderness Values" information sheet. Share books included in the box and discuss the wilderness values they emphasize.
- Have students create their own poetry using metaphors and similes about wilderness.

Evaluation:

Ask students to create their own similes and comparisons.

"The richest values of wilderness lie not in the days of Daniel Boone, nor even in the present, but rather in the future."

- Aldo Leopold

WILDERNESS VALUES

- Wilderness protects watersheds which many cities and rural communities depend on for pure water.
- Wilderness serves as critical habitat for wildlife threatened by extinction.
- Wilderness improves the quality of our air because of the filtering action of its plants and forest.
- Wilderness maintains the genetic material to provide diversity of plants and animal life. Today, as we learn more about the greenhouse effect and the depletion of the ozone layer, more and more people are coming to realize that humans are only part of an interconnected 'web of life,' and that the survival of our own species may ultimately depend on the survival of others.
- Wilderness serves as a unique and irreplaceable 'living laboratory' for medical and scientific research. Already plant and animal species existing in their natural states have played major roles in the development of heart drugs, antibiotics, anti-cancer agents, and anticoagulants. More than one-quarter of all the prescriptions sold in America each year contain ingredients from plants.
- Wilderness provides for the protection of geological resources. Undisturbed, naturally occurring geologic phenomena are protected for present and future generations.
- Wilderness serves as a haven from the pressure of our fast paced industrialized society. It is a place where we can seek relief from the noise and speed of machines, confines of steel and concrete, and the crowding of people.
- Wilderness is a unique repository for cultural resource values. Artifacts and structures are protected by the Archaeological Resources Protection Act and they take on a new perspective when experienced within the context of the wilderness. These features tell a valuable story about the human relationship with wilderness.

For all its uses, values, and scenic wonders, wilderness is a land heritage that is uniquely American. In the words of novelist Wallace Stegner, "Something will have gone out of us as a people if we ever let the remaining wilderness by destroyed."

Credit: This text is excerpted from the " **Wilderness Awareness Training Module**" produced by Arthur Carhart National Wilderness Training Center, US Forest Service.

Lesson 4: My Side of the Mountain

Objective:

Students will enrich their perspective of wilderness through age appropriate literature.

Background:

Most of us can remember a time in our childhood when we wondered what it would be like to live in a home and community completely unlike our own familiar setting.

In ***My Side of the Mountain****, Jean Craighead George creates the adventures of a boy who leaves his urban home to live alone in the mountains. This selection is not intended to be an encouragement for students to do this(!) or an example of survival skills. It is included as an intriguing tale through which students may see some of themselves as they relate to the main character, Sam. An excellent introduction to the book is provided by the author's preface.*

See Also:

- Natural Resource Values—(Elementary-Aesthetics), Page 111
- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Where Do You Stand?—(Middle-Aesthetics), Page 227
- Wilderness Values—(Middle-Aesthetics), Page 233
- Wild By Law—(Middle-Perspectives), Page 261

Activity 1: My Side of the Mountain

Materials: ***My Side of the Mountain***

Procedure: 1) Read and share ***My Side of the Mountain*** with your class. The following ideas for questions and activities focus on connections between events in the story and aspects of wilderness. Some may serve as topics for responsive journal entries; as subjects for group discussions; or as research projects. Others involving illustrations might engage students as they listen to the story. They are listed in order of appearance within the book. Select those that will be most meaningful for your class.

- Make an illustration of Sam's tree home and surroundings based on your impressions from the first few pages.
- Create a map of the mountain. Add details and locations as they appear in the story.
- When he discovers Sam's plans, the truck driver says, "Do you think you'll be scared of the woods? When I was your age, I did the same thing. Only thing was, I was a farm boy and ran to the city." (p.11) Are you more like Sam or the truck driver when he was a boy?
- Sam kept track of the days of the year, by putting notches in a stick. Why was this was important for him? What other methods could be used?
- How do some of Sam's practices differ from those described in the skills section of this curriculum? What might happen over a long period of time

if large groups of people used a wild area in this way?

- Research peregrine falcons. Discover why they are endangered and learn about the methods used to protect and preserve them.
- Sam uses Frightful to hunt for him. Research the history and present-day practices of falconry.
- Baron is a weasel. Research weasels and learn about the ways they adapt to seasonal changes and their place in food webs as a small predator.
- Bando's nickname for Sam is "Thoreau". Who was Henry David Thoreau? Imagine a conversation between Thoreau and Sam. How might they be alike?
- One entry is called "In Which We All Learn About Halloween". What does Sam learn about feeding wild animals? Do you know of any similar situations?
- Write a response to Sam's use of deer hunters had shot but not found.
- On Page 118 Sam humorously compares his woodland "neighbors" to his old city neighborhood. Are there ways your neighborhood is like a wild community?
- Upon discovering a great horned owl on the farm Sam records, "It is really very special to have a horned owl. I guess I feel this way because he is such a wilderness bird. He needs lots of forest and big trees...so his presence means that the Gribley farm is a beautiful place indeed." (p.136) How does this statement express Sam's values of what makes a place "beautiful"?
- After a dramatic ice storm Sam writes, "The mountain was a mess. Broken trees, fallen limbs were everywhere. I felt badly about the ruins until I thought that this had been happening to the mountain for thousands of years and the trees were still there, as were the animals." (p. 141) Discuss ways this conclusion is similar to the approach to fire management in Wilderness described in the ecology strand, lesson four. *Both perspectives acknowledge events like fires and storms as natural components of ecosystems, whose effects are part of cycles operating over long periods of time.*
- After hearing a report of news events from Matt, Sam responds, "It all proves my point. People live too close together." He goes on to explain why he is living on the mountain. When Matt seems to understand these qualities, but questions him about being lonely, Sam responds, "There are people in the city who are lonelier than I". (p.161-162) Discuss responses to these questions. How do they relate to where you live? *This discussion might be facilitated by listing the benefits and disadvantages of living in both urban and wild places.*

- Before reading the final section, "The City Comes to Me," make predictions about how you think the story will end, or write your own ending.
- Discuss the ending of the book. Sam's grandfather had been on the land when it was a farm. To Sam it has been a wilderness refuge. If you were to write a sequel to the story that takes place 10-50 years in the future, what would the first paragraph be? *For example, "Ten years later Sam returned to the tree..." or "When she was 16, Sam's granddaughter went to visit the Gribley farm where her grandfather had once lived...."*

Evaluation:

Evaluate completion of suggested activities.

> *"I went to the woods because I wished to live*
> *deliberately, to front only the essential facts of life,*
> *and see if I could not learn what it had to teach ."*
>
> *—Thoreau*

PERSPECTIVES THROUGH TIME

Lesson 1: Wilderness Time Line: The Long and Short of It

Objective:

- Students will gain perspective on wilderness preservation represented by a timeline of geologic history.

Background:

Within our comparatively brief lifetimes, it is difficult to gain a perspective of geologic time and the natural events that have succeed our presence on the earth. This lesson creates a visual representation of geologic time noting key dates along a length of string and a scale of 1 inch per 8,000,000 years.

Note: The timeline of 4.5 billion years is presented here as **geological theory**. It is not the objective of this project to debate issues of evolution, age of the earth, or earth's origins. Rather this activity is included to increase awareness of the impressive and comparatively short time human actions have influenced natural resources formed throughout millennia, and the importance of the preservation of some of these areas as well as ethical use of natural resources in the future.

See Also:

- Introduction to Wilderness—(Primary-Overview), Page 47
- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Introduction to Wilderness—(Middle-Overview), Page 209
- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Historical Perspectives—(Middle-Perspectives), Page 245

Activity 1: Landscapes Through Time

Materials:
25 feet of string or cord
ruler and measuring tape
notecards

Procedure:

1) Explain that most geologists believe the planet earth is around 4.5 billion years old. Discuss the concept of billions. Is there a billion of anything in your surroundings? Do you see anything in your surroundings that might be a million years old? Do you know any natural features that could be a thousand years old?

2) Write down the following dates on one side of note cards and occurrences on the other.

OCCURRENCES	DATES	DISTANCE
Planet Earth originates	4.5 billion years ago	20 ft.
1st single cell life	2 billion "	6ft.
1st multicellular life	600 million "	5ft.
Bone bearing animals appear	500 million "	4ft
Fish are major life form	400 million "	3ft.
Coral forms in Eastern swamps	300 million "	2ft.
Reptiles take to the air	200 million "	1ft.
Dinosaurs dominant animals	100 million "	9in.
Flowering plants appear	80 million "	1.25 in.
First horse, ape, dog, and cat families	8 million "	1 in.
Humans appear	2 million "	5 in.
Last major ice age ends	10,000 "	hair width
Public land established	100 "	1/100 "

3) Locate students with cards along the cord or string at corresponding dates/measurements. Have each student share their information. After the activity you may wish to post the string and cards along a wall. Students can add illustrations to correspond with each occurrence.

4) Discuss responses. Which information surprised students? Which dates were of special interest? Imagine some events that you think could appear on a time line that stretches one hundred, one thousand, or one million years into the future.

Evaluations: Test students on matching dates with historical occurrences.

Activity 2: Rocks

Materials: **Rock and Mineral Specimens**

Hand lens

Nut pick, fork, or other pointed steel tool

Procedure: 1. Read the Student/Teacher Information Sheet on the next page. Explain that wilderness can be a good place to study the rock cycle, because specimens have not been moved or altered by human activities, so they tell the true stories of the long-term natural geological processes that make the rocks what they are.

2. Organize students around a specimen set. Arrange for one specimen set for every four students. Ask students to group the specimens into igneous, sedimentary, and metamorphic rocks with a separate group of minerals.

3. Ask students to examine each rock with the hand lens and scratch it lightly with the pick (monitor safety closely) and answer the following questions:

- What similarities do you see in all the igneous rocks? (e.g., fairly hard, contain either specks of tiny hard glassy minerals, or is entirely made of a hard glassy material)

- What similarities do you see in all the sedimentary rocks? (e.g., fairly soft, a little crumbly)
- What similarities do you see in all the metamorphic rocks? (This will be the hardest, but all look as though they have been compressed from somethingelse)

4. Ask students to try to line up all the rocks and minerals from hardest to softest. (Be careful to scratch rocks lightly)

- Where do the igneous rocks tend to be? Sedimentary? Metamorphic? Minerals? Why would this order be this way?

5. Ask students to place the rocks and minerals back into their appropriate boxes in the container.

- Based on the way the rocks and minerals look and feel, which ones appear to be related?:

  Granite and Rhyolite (both intrusive igneous)

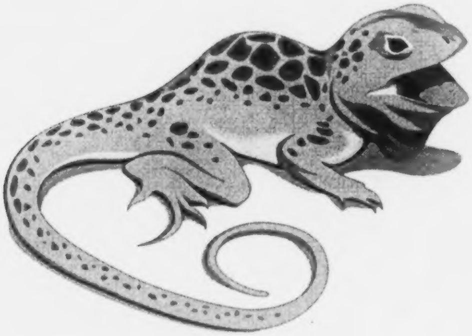
  Shale and slate (slate is metamorphic shale)

  Milky Quartz, Rose Quartz, Fluorite (Quartz with different mineral influences)

  Calcite and Gypsum

Beauty created by Nature is equal in value to, and to be accorded reverence equal to that of the beauty of music, art or poetry of man, and experts are available to testify as to degrees of natural beauty just as they are able to testify to the quality of mortals' art.

—David Sive



THE ROCK CYCLE

The study of geology and mineralogy gives us an exciting new understanding of the earth around us. We begin to discover that rocks and geologic features that we had always thought of as being permanent are not really permanent at all. Everything on earth is constantly undergoing change.

Volcanic action, buckling of the earth's surface due to changing pressures, cooling and shrinkage, plus erosion from the forces of the wind, water, heat and cold, are changing all matter continuously in the dynamic process of the rock cycle. Molten magma beneath the earth's crust crystalizes as it cools to become *intrusive igneous* rocks, or at times is thrust directly to the earth's surface to become lava or *extrusive igneous* rock. Igneous rocks are broken down by weathering and transported by wind and water to form sediments, which become cemented together to form *sedimentary* rocks. Sometimes sedimentary or igneous rocks are subjected to great heat and pressure beneath the earth's surface and are gradually transformed to *metamorphic* rocks. And at times they are pulled down and melted into magma again, and the cycle begins again.

This action, though almost unnoticed during the short lifespan of one person, has in the past, and will in the future, continue to change the entire face of the earth. Wilderness was shaped through this cycle over millions of years before humans emerged on the scene to struggle with, admire, and ultimately to preserve wilderness lands.

Most geologists place rocks and minerals in separate categories. Rocks are composed of one or more minerals in varying proportions that constitute a basic formation of the earth's crust. All rocks can be classified into one of the three basic categories: Igneous, sedimentary, or metamorphic. Igneous rocks are formed from the cooling of a magma. Sedimentary rocks are formed by various cementing actions of loose sediments such as those that accumulate in lakes, basins or ocean floors. Metamorphic rocks are those that have been altered in form by tremendous heat or pressure.

Lesson 2: Historical Perspectives

Objectives:

- Students will describe and compare attitudes towards wilderness represented by different groups throughout the period of westward expansion in the United States.
- Students will experience communication skills that may have been used by early wilderness travelers, in a creative map making activity.

Background:

The history of the West may be seen as a story of the coming and going and sometimes remaining, of many different groups, each pursuing their own goals in the vast undeveloped terrain of the western United States. Trappers, miners, ranchers, loggers, and other early settlers viewed wilderness from a variety of perspectives. The economic and often physical survival of these early settlers was closely connected to their use of the resources available in this "untamed wilderness " Activity 1 is designed to develop an awareness of these different historical view points.

Before maps of the West were developed, mountain men, trappers, explorers, and American Indians used symbolic maps to communicate the availability and location of resources. Mountain men and other early adventurers depended on their attention to the landscape around them and their knowledge of travel routes, to guide them to areas rich in beaver and other valuable trade items, through mountain passes, and to towns and villages. Activity 2 is a map making exercise in which students consider resource use and communications about them by putting themselves in the place of early wilderness travelers. This activity compliments others in the overview, ecology and skills strands that also focus on map use.

See Also:

- Introduction to Wilderness—(Primary-Overview), Page 47
- Once Wild—(Primary-Perspectives), Page 57
- The Wilderness Wildbook—(Primary-Skills), Page 89
- Introduction to Wilderness—(Elementary-Overview), Page 105
- Living in the Wilderness—(Elementary-Perspectives), Page 119
- Introduction to Wilderness—(Middle-Overview), Page 209
- Wilderness Time Line: The Long and Short of It—(Middle-Perspectives), Page 241

Activity 1: Through Historical Eyes

Materials:	Books & photos documenting your state's and western history, **"Through Historical Eyes"** student/teacher information page.
Procedure:	1) Read **"Through Historical Eyes"** student/teacher information sheet (Page 249) individually or as a group. Review some events in American history that are already familiar to your class. This might include an orientation in time to dates of colonial settlement in New England; Spanish exploration;

historical personalities and events in other countries; and any other events that will help set the stage for this time frame, of the past 150 years.

2) Divide students into groups representing trappers/mountain men; miners; ranchers/farmers; loggers; and business people. If you need more groups add railroad builders and early explorers.

3) Explain that students are to imagine they are members of this economic group living in the Rocky Mountain area in the early 1800's. Each group makes a living in a different way, however they are all several days distant from communities where they can get supplies. Using the resources you have collected and library references each group should research, discuss and answer the following:

How will you provide yourself with shelter, food, and clothing? You might be able to acquire goods at a small town; however, you will need materials with which to trade.

What are your greatest concerns and priorities?

How will you use the resources of your natural environment? Are there some resources you are using indirectly?

Would you generally have positive, negative, or mixed emotions about the wilderness around you? Everyone in your group might not have the same attitude; however, it is important that each member express him or herself.

4) Group presentations may be conducted in a variety of ways:

- Each group presents their information through a brief skit or mime that portrays their wilderness use and attitudes.
- Collectively or individually, group members write fictitious letters to relatives or friends in the East, describing their life in the wilderness.
- One character interviews the others of the group.
- Written reports and illustrations.

5) As a class, discuss similarities and differences between groups: What did they want to get out of wilderness? Did any group seem concerned about 'running out' of these resources?

Was wilderness an obstacle, a source of enjoyment, or both? What lasting impact did each group leave upon their environment? Do you think these were/are significant?

How are present-day uses of wilderness similar to the use by your group? Do Wilderness regulations allow some of these historical uses? How are the different? (Reference introductory information of curriculum addressing Wilderness regulations.)

How are attitudes about wilderness different today? Why?

How do you think wildernesses 100 years from now will look different from wildernesses of today? What kind of use might they have?

Evaluation:

Evaluate group presentations.

Activity 2: Early Messages/Maps Without Words

Materials: Writing & drawing materials for each group

Large (3'x3') sheets of paper, one sheet per group

Procedure: 1) Discuss how the first maps of the West may have looked. Who might have used them? Why? How would they have communicated if they didn't have a written language? What if two groups had different languages?

2) Divide students into four to six groups of four to five members. Each group receives one message from the "message sheets" (Page 251). They are responsible for recreating it on their paper, in any manner without numerals or letters to convey its meaning to another group. It is helpful to assign corresponding numbers to maps, messages, and groups. Groups that finish early might be encouraged to make their work more elaborate.

3) Once maps are complete groups move to another map, note the map number, and the write a message they believe it illustrates. One way to do this is to rotate groups around the room. This can be be done for all the maps, or for just one or two.

4) When each group has completed this process, examine the maps, and compare the interpreted messages with the original messages.

5) Share ideas about the following: What aspects of the messages were difficult/easy to convey?

What different methods were used to show direction? Distance? Resources?

Were there symbols used? How did groups decide on creating symbols?

Were there some universal qualities among symbols for the same thing on different maps? What are some the values of using symbols? Disadvantages?

What form might these maps have taken if they were created in the early 1800's? What materials might have been used? (Skins? Bark? Rocks?)

Are there advantages/disadvantages to using landmarks? (Fire might destroy them, etc.)

Why were these resources important to the people finding them?

Did any of the descriptions remind you of places you've been?

Extensions:

- Learn about current practices in mining, ranching, and logging within National Forests and wildernesses. Compare these to those studied in this lesson. Create a presentation to share this through drama, writing, or illustrating. Imagine a miner of 1860 meeting a modern day miner. What would they have to say to each other?

- Research wilderness policies in other countries and how they relate to development, population, economics, and culture.
- As you are researching, watch for biases of the authors. Does their culture/race influence how they portray others? Many nationalities of immigrants worked to develop the West. Look for references to them.
- Bring in historical artifacts (old tools, equipment, kitchen utensils, etc.), and old photos from families whose ancestors lived in the West during this time period.
- Research early maps and American Indian symbols.

Evaluation:

Have students create new messages and repeat Activity 2.

Ask students to trade messages and locate which map corresponds to the message they wrote.

There's a land where the mountains are nameless,
And the rivers all run God knows where;
There are lives that are erring and aimless,
And deaths that just hang by a hair;
There are hardships that nobody reckons;
There's a land—oh, it beckons and beckons,
And I want to go back—and I will.

Robert Service "The Spell of the Yukon"

THROUGH HISTORICAL EYES

American Indians, explorers, trappers, miners, loggers, ranchers, railroaders, and other early settlers viewed wilderness from different perspectives than do most of us in these profoundly different times. They often depended upon exploiting and/or conquering the wilderness for their livelihood. It was at least as much a source of danger as of inspiration.

The American Indians had relatively little impact upon the wilderness. They had neither the numbers nor the mechanical means to alter it greatly. It provided the resources for their existence. It is understandable that they often reshaped elements of their natural environment.

The early explorers entered the wilderness in search of wealth, (such as gold or furs), souls to save, or travel routes to span a huge continent. They made very few direct marks upon the wilderness. In fact, its harshness left many dead and suffering among the explorers' ranks. Nevertheless, they opened the gates for the trickle of Europeans that eventually became a flood.

Like American Indians, the trappers had modest impact upon the land. Still, they introduced firearms, and other manufactured metals to the wilderness on a sustained basis. The streams that became "trapped out" revealed the ethic that has brought to our language terms such as 'farmed out", "fished out," and "cut out." And to the American Indians, the trappers brought disease, whiskey, and almost surely a gnawing dread of what the future might hold. A few of those trappers also brought word that gold was to be found in the vastness of the West.

In the aftermath of the Panic of 1857, people desperate for a new start came West in search of gold. False rumor and fraud was much more abundant than gold, but the gold was there in enough quantity to bring the first large migration to the West in 1859 and the early 1860's. The mining frontier brought the first all-out exploitation of the wilderness in the West. Nothing (and no one, to the sorrow of American Indians), was to stand in the way of the search for gold .

The mining communities in turn gave rise to industries such as logging to supply cordwood, lumber, and charcoal to the mines. Nature's own healing has reclaimed and prevented much devastation. Many of the mining boomtowns, however, still look out upon treeless hillsides to remind them of the folly of unchecked greed.

Credit: Written by Jerry Davis, US Forest Service, Pike/San Isabel National Forest

MESSAGES FOR "MAPS WITHOUT WORDS"

Message # 1

From this place, travel three days to the west across the prairies. Where the stream comes out of the mountains you will see huge red rocks standing upright. Among the rocks you will find a trail. Follow the trail south for two days. It will lead you through high mountains. Then you will come to a place where you can see below you a large open meadows. This is a good place to hunt. There are many bison, antelope, and deer in this area.

Message #2

From here travel along this side of the river for two days. Then you will see the place where there is a very old tree standing alone on the right side of the river with an eagles nest in it. Here there is a log across the the stream that you may cross on. To the west you will see three low hills. Go to these hills and on top of the middle one you will find good rocks for making spear points.

Message # 3

From here travel north for four days, past the little lake with the island in it, until you come to the big lake. The east end of the lake is surrounded by low bushes. This is a good place to hide and to hunt ducks. There are many of them on the lake!

Message # 4

From this place travel upstream through a narrow canyon until you come to the place where there is a pile of rocks. On your right you will see a rope hanging down the steep canyon walls. Climb the rope and you will get out of the canyon. Travel towards the mountains for two days. At the base of the mountain with the flat top that still has snow on it you will find our camp.

Message # 5

From here, it is best to make a raft and float downstream through the mountains. After three days, when the river comes to a large valley with many small ponds in it, look for the cabin in a meadow on the east side of the river. This is a good place to spend the winter and to trap beavers in the ponds.

Message #6

From here, follow a faint trail to the west across the flat country, for three days. When you come to the mountains, leave the trail and climb towards the group of old trees that stand on a ridge. Before you get to the old trees you will come to a small stream. Follow the stream to the spring that it comes from. In this meadow you will find many plants whose roots are good for eating.

Lesson 3: Personalities and Philosophies in Wilderness Preservation

Objectives:

- Students will describe several of the principal personalities and their philosophies in wilderness preservation history, such as George Catlin, John Muir, Arthur Carhart, Howard Zahniser and David Brower.
- Students will research one person identified as a wilderness hero or heroine and list three important biographical facts about him or her.
- Students will list at least three important values that this person held about wilderness or the environment and its preservation.
- Students will list at least one action this person took to protect and preserve wilderness or wildlife.
- Students will list reasons for an absence of wilderness heroines in our history books and other reference materials, who those heroines are/were, and what their contributions have been to wilderness and wildlife.

Background:

Environmental history is one of the major thematic areas of United States history, especially from the early 19th century to the present. Wilderness preservation has held a prominent place among environmental issues which have captured the American imagination for over 100 years. From the original idea of a national park, attributed to painter George Catlin, to the wanderings and writings of John Muir, the recommendations of Arthur Carhart, the land ethic of Aldo Leopold, and the tireless bureaucratic battling of Howard Zahniser, there have been many American heroes and heroines of wilderness preservation. Many of the important events and dates in this American adventure are summarized in the Background Information section of the curriculum.

Activity 1 is a biography lesson on John Muir, "the sage who foretold the entire American conservation movement" (Ronald, 1987). The idea is for students to try to understand how Muir's background uniquely prepared him for the transcendent wilderness life that he led and advocated. Activity 2 provides research exercises for individual students or small groups to learn more about significant heros and heroines of the wilderness movement.

See Also:

- Wilderness Act History—(Elementary-Perspectives), Page 12
- Where Is Wilderness?—(Middle-Overview), Pagd 215

Activity 1: John Muir and His Legacy

Materials: Student/Teacher Information Sheet

Words for the Wild

Procedure: 1) Ask students to read to themselves the Student/Teacher Information Sheet on the life of John Muir (Page 257). Discuss his biography.

- What were some of his most important contributions to us?
- In what ways was he like you? In what ways was he different?

- What were the really unique experiences he had and choices he made?

2) Read "A Wind-Storm in the Forests" from ***Words for the Wild*** in the Wilderness Land Ethic Box. We suggest you read this aloud to the students. You may want to excerpt sections of the reading only. As you read, stop periodically to point out the incredible audacity of Muir's actions (climbing to the top of a 100 ft. high tree in a storm!). Mention the light-hearted joy and almost total absence of the sense of risk and danger that runs throughout Muir's writing. The sensitivity of his descriptions of light, color and wind also deserve a pause. You may want to develop a vocabulary list ahead of time to distribute to students. Then when you read such passages as *"redolent* of all the purest influences of the spring," you can ask *them* what it means.

3) Discuss:

- Now that you know a little about John Muir's life, what experiences in his past prepared him for this adventure?
- What experiences in his past would cause him to appreciate the sensory stimulation of the storm so intensely?
- What are some values that John must hold that would motivate him to do this? (e.g. he is willing to take physical risks to be close to wild nature; he believes he can understand much about the world by close contact with nature, etc.)
- How are you like John Muir? How are you different? How would you feel about living a life in the wilderness?

Credits: The biography of Muir is adapted from:
Wellman, J.D. (1987). *Wildland Recreation Policy.* New York: J. Wiley and Sons, and Fox, S. (1981). *John Muir and his Legacy.* Boston: Little, Brown.

Activity 2: Wilderness Heroes & Heroines

Background:

Today we have approximately 103 million acres designated as Wilderness. Wilderness provides us with scenic, ecological, geological, scientific, educational, and historical values. Each of us may seek different values from Wilderness. Wilderness heroes and heroines are chosen partly because they hold certain values in common with those who select them. Very few heroes and heroines believe in everything we do or behave in ways that we totally approve of. Values that are not like ours aren't necessarily wrong; they are sometimes simply different. This means, we can select a variety of heroes as models and others can respect our different choices.

Many individuals have worked to advocate stewardship and preserve land as Wilderness over the past 200 years. Much of what we have and enjoy today as Wilderness, we owe to people like John Muir, Henry David Thoreau, Ernest Thompson Seton, Margaret and Olaus Murie, Bob Marshall, Arthur Carhart, Aldo Leopold, Wallace Stegner, Sigurd F. Olson, Mary Austin, Lady Bird Johnson and Howard Zahniser.

These people are admired and respected for their qualities and achievements in preserving Wilderness and promoting a land ethic. They have emerged as heroes and heroines because of the energy *they devoted to changing the way society looks at wildlife and wild places. Wilderness heroes and heroines come from all walks of life and their contributions to wilderness may come as a result of their writing as naturalists, as political leaders, artists, or as field scientists.*

In this lesson, students will study the values & actions of historic heroes and heroines in order to help them develop and refine their own wilderness and land ethic.

Materials: Videos: "**Wild By Law**"*and* ***Battle for Wilderness "The Wilderness Idea"***
Books: ***Words for the Wild***, ***Public Lands, Public Heritage; The National Forest Idea***, ***Centennial Mini-Histories of the Forest Service***, ***U.S. Park Service, 75 Years***
Wilderness Heroes and Heroines Resource List Journals: "Women and the History of American Conservation," ***Women in Natural Resources***, 1990 Vol 11, No. 3.

Procedure: 1) The **"Battle for Wilderness: The Wilderness Idea"** is an excellent video to use with for this lesson. Show students **"Wild By Law"** or **"Battle for Wilderness,"** Use one of these videos to show students how to identify significant biographical facts and environmental values that made this person a hero or heroine.

2) Engage students in discussion on the following questions:

- How was this person's life like yours? (list on the board)
- How was it different? (list)
- What values did this person develop because of his/her life experiences? (list)
- Of the values listed, which three do you think brought them the most fame? Why?
- Now can we pick three life experiences (biographical facts) which helped these values develop? If there is disagreement about what is "most important", discuss this and the reasons why we each person value different things as important. Very few heroes and heroines share identical values, believing in everything you do or behaving in ways that we totally approve of. Values that are not like ours aren't necessarily wrong; they are simply different.
- Why do you think there are so few women recognized in history as heroines for wilderness and wildlife? Do they exist? Who are they and what contributions have they made? (list)

3) After students have examined the life of the same hero or heroine, ask them to each select a person to investigate from the resource list accompanying this lesson. Encourage students to add names of heroes and heroines to the resource list. Provide students with additional resource information to find examples of wilderness heroines.

Extension:

- Make a chart containing the headings: name of hero or heroine, biographical facts, and wilderness values. Compile these into a journal to be shared by all of the students.
- Explore how the times during which selected heroes and heroines lived might have impacted their values. How were they affected by other things going on in the region, state, country or world. Consider how these events encouraged or limited their achievements.
- Research the role models who influenced the selected heroes and heroines. Create an environmental values "family tree" showing the connection that each generation of heroes and heroines had to the next. Consider yourself in the family tree and imagine who will follow you.
- Write a play, story, poem or song or make a slide show or video about the heroes or heroines you have identified. Share these stories with your school and community.
- Assign an essay to address the question, "Who will be the wilderness heroes and heroines of the future?"

Evaluation:

Evaluate student research skills and research paper that students have completed on a wilderness hero or heroine.

Credit: Adapted from **Environmental Heroes and Heroines: An Instructional Unit in Earth Values and Ethics** by Clifford E. Knapp, Produced by the Environmental Education Association of Illinois and reprinted by the Illinois Department of Conservation and Pheasants Forever, Inc., 1993. Pp. 4-5.

> *What is life? It is the flash of a firefly in the night. It is the breath of a buffalo in the winter time. It is the little shadow which runs across the grass and loses itself in the Sunset.*
>
> *—Crowfoot*

JOHN MUIR: MAN OF THE MOUNTAINS

Legend has it that when John Muir first got off the ship in San Francisco in 1868, he asked the first person he saw how to get out of town. Asked where he wanted to go, he responded "Anywhere that is wild." Muir, more than any other 19th century spokesperson for the natural world, captured the spiritual rapture that many people feel in wild nature.

John Muir was born the son of a prosperous grocer in Scotland in 1838. He was apparently a pretty wild young boy and was regularly beaten by his stern and religious father for real (and sometimes imagined) wrongdoings. When John was eleven, the family moved to Wisconsin and John was forced into grueling child labor on his father's farm. One time he was made to hand-chisel a well 90 feet deep! He was also forced to memorize much of the Bible, a feat which served him well later in his life when he would use eloquent religious arguments for the preservation of wilderness. John's powerful mind often turned to inventing things, and the local reputation of his inventions eventually allowed him to escape the drudgery of the farm.

In 1860, John found himself at the University of Wisconsin, where he quickly became interested in geology and biology. At the same time, however, the two professors who influenced him most were both students of Ralph Waldo Emerson, the great American transcendentalist philosopher. So while Muir studied science, he never wavered in his conviction that all of nature was God's handiwork. He never finished his studies at Wisconsin was constantly torn between his success as an inventor and his love of nature. Finally, after being nearly blinded in an accident in a broom factory, he knew that he had to devote himself to the wild. He walked alone from Indiana to the Gulf of Mexico, and caught a boat for San Francisco.

In California's Sierra Mountains, Muir found his spiritual home. He worked as a shepherd, and then as a sawmill operator. He built a house with a stream running right through the middle! He challenged the dominant geological theory of the day that the Sierras were made by violent geological accidents, and instead proposed the novel idea that glaciers once covered the valley floors. He documented this idea through careful measurements and then wrote a newspaper article about it. Articles like this one made John Muir a famous nature writer and botanist in the 1870's.

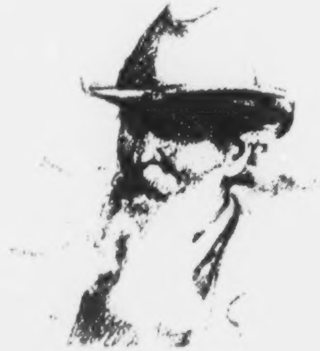
In 1871, three years after John had come to California, Ralph Waldo Emerson came to visit. John was very shy about talking to the great Emerson, but eventually he did invite Emerson to "join me in a month's worship with Nature in the high temples of the great Sierra Crown beyond our holy Yosemite." Emerson declined—after all he was 68 years old—but he did send John some of his essays about nature. John Muir was influenced by the transcendentalists Emerson and Henry David Thoreau, but Muir came to the conclusion through his own experiences that wild nature was God's work.

In 1888 Muir went on a camping trip in Yosemite, with publisher Robert Underwood Johnson, that would change his life. They found the park (a *state* park at that time) a mess. Many trees had been cut, sheep were grazing everywhere, and there were dams and tourist businesses. Muir and Johnson loved this park, and they vowed to fight in Congress for a Yosemite National Park "forest reservation" surrounding the state park to protect it. Two years later, Congress passed a law making this reservation, the very first national land preserve established to protect wilderness.

Muir and Johnson recognized from this battle that there was a need for an organization of people dedicated to protecting wild lands through government action. Muir wanted to combine this with trips to the wild lands that the organization would fight for. Thus, in 1892 the ***Sierra Club*** was born.

There were many successful battles for wilderness preservation carried on by the Sierra Club in those early years. But perhaps the biggest battle of all ended in defeat for John Muir. This was the conflict over the Hetch Hetchy Valley inside Yosemite National Park. It seemed the city of San Francisco had its eye on the valley as a reservoir site for the city's water supply! Muir and his supporters mounted a national campaign to stop the dam. The arguments he used were almost religious in tone: "Dam Hetch Hetchy! As well dam for water tanks the people's cathedrals and churches." But then came the 1906 San Francisco earthquake which destroyed the city's existing water supply. Finally, in 1913 President Woodrow Wilson signed a law authorizing the Hetch Hetchy Reservoir inside a national park. A year later, John Muir died, broken by the battle.

But the dam in Hetch Hetchy brought wilderness preservation right in front of every American's eyes. For the first time in our history we actually *thought about* not building a dam just because it would be in a park. Only three years after this, the National Parks Act was passed setting up a nationwide system of national parks. *This* was John Muir's great legacy to us.



Walk away quietly in any direction and taste the freedom of the mountaineer.... Climb mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves.

—John Muir

WILDERNESS HEROES AND HEROINES RESOURCES LIST

Abbey, Edward
Adams, Ansel
Austin, Mary
Bird, Isabella
Black Elk
Bolle, Arnold
Brower, David
Burroughs, John
Carhart, Arthur
Carrighar, Sally
Carson, Rachel
Catlin, George
Chief Luther Standing Bear
Chief Seattle
Church, Frank
Comstock, Anna Botsford
Douglas, William O.
Eiseley, Loren
Emerson, Ralph Waldo
Giono, Jean
Greeley, William B.
Hunter, Celia
Johnson, Lady Bird
Johnson, Lyndon
Jackson, Harriet West
Jardine, William H.
Krutch, Joseph Wood
Lee, Katie
Leopold, Aldo
London, Jack
Marsh, George Perkins
Marshall, Bob
Mather, Stephen T.
Mills, Enos A.
Muir, John
Murie, Margaret
Murie, Olaus
Nelson, Gaylord
Olmsted, Frederick Law
Olson, Sigurd
Petzholdt, Paul
Pinchot, Mrs. James
Pinchot, Gifford
Powell, John Wesley
Roosevelt, Theodore
Rutstrum, Calvin
Service, Robert
Seton, Ernest Thompson
Thoreau, Henry David
Udall, Stewart
Walton, Izaak
Wayburn, Ed
Wayburn, Peggy
Whitman, Walt
Zahniser, Howard

Lesson 4: Wild by Law

Background:

There are three activities proposed for this lesson. First, we recommend you conduct the Wilderness Cards *Activity and then watch the* Wild By Law *video as part of Activity 3,* In Your Own Words. *The video is an excellent historical documentary, produced for the Public Broadcast System. It takes us from the early years of the 20th century through the passage of the Wilderness Act in 1964, by explaining the lives and accomplishments of three people: Aldo Leopold, Bob Marshall, and Howard Zahniser. The pictures are wonderful and there is a good sense of humor, which you can highlight for the students.*

Finally, we recommend that you do Citizen Action: The Wilderness Act *from* The Green Scene, *included in the brown accordion folder in the Wilderness Box. If you do all three activities, the students should be ready for the final section of* Citizen Action, *which means actually getting involved in a local land conservation issue.*

See Also:

- Natural Resource Values—(Elementary-Aesthetics), Page 111
- Perspectives of Wilderness—(Middle-Aesthetics), Page 219
- Where Do You Stand?—(Middle-Aesthetics), Page 227
- Wilderness Values—(Middle-Aesthetics), Page 233
- My Side of the Mountain—(Middle-Aesthetics), Page 237

Activity 1: Wilderness Cards

Materials:

Laminated Wilderness cards,
Dictionary,
Paper, pencil or pen,
Chalkboard, butcher paper or flip chart

Procedure:

1) Break class into small groups of two to three per card. Pass out **Wilderness cards.**

2) Encourage students to look up words in the cards they do not understand. Ask student groups to read each phrase card, discuss with each other what the phrase means and rewrite it in their own words. Allow 15 minutes for each group to work through their cards.

3) Ask each group to share their interpretation with the rest of the class. Record student responses on paper that you can save for Activity 3, In Your Own Words.

4) After students have reported to the class, read Section 2(a) and (c) out loud. Most of the phrases from the **Wilderness Cards** are from these two sections of the Wilderness Act.

5) Tell students they will be receiving further information about the Wilderness Act in Activity 3, In Your Own Words, and will be rewriting the Wilderness Act in their own words.

Extension:

- This activity is a good primer for the video, "**Wild By Law**"

Activity 2: In Your Own Words

Materials: pen, paper (journal)

Wild By Law video (Length is one hour)

VCR and monitor

Teacher Information, ***Wild by Law*** discussion questions

Procedure: 1) Review student responses from the ***Wilderness Card Game***. View ***Wild By Law*** with your students. The length of the video is one hour. You may want to break the video into several sessions. Assign or discuss ***Wild By Law*** discussion questions or make up your own set of questions.

2) Talk about what Wilderness is.

3) As an individual activity, each student will write, in their own words, the Wilderness Act. One or two paragraphs is adequate.

Evaluation:

Evaluate final draft of Wilderness Act re-write.

Assign discussion questions from ***Wild By Law*** video.

Activity 3: Citizen Action: The Wilderness Act (Green Scene)

Materials: This lesson from the ***Green Scene, Citizen Action: The Wilderness Act*** can be found in the brown accordion folder in the Wilderness Box.

Citizen Action: The Wilderness Act from the Green Scene.

One copy for every four students of each of the following handouts:

What? The Wilderness Act

Why? Wilderness

How? The National Wilderness Preservation System

Who? A Wilderness Ethic

One copy for every eight students of the Trivia Cards and Blank Trivia Cards.

One copy for every four students of the Local Concerns Action Plan

Map of the National Wilderness Preservation System and State Wilderness status map

Procedure: 1) Post the maps ahead of time so that students can familiarize themselves with locations of Wildernesses. Ideally, do activities in the Overview Strand first, and view ***Wild By Law*** before you do this activity.

2) Conduct Part 1 of the activity as explained in the lesson. Plan two 45-minute class periods for Part 1.

3) We recommend that you try Part 2 of the activity, especially focusing on getting students involved in protecting the environmental quality of a local natural area. If you have completed all the activities in this lesson as well as those in the Overview and Aesthetics Strand, students should be ready and eager to become personally involved in an environmental issue.

WILD BY LAW DISCUSSION QUESTIONS

1. Who were the three men who fought to save over 100 million acres of wilderness?
2. Describe what symbolic & physical effects the automobile had on wilderness?
3. What is the thing American did that no other country had ever done ?
4. What did the twentieth century provide, in the name of progress, for the average American citizen?
5. Describe Aldo Leopold's professional and personal life. Explain how Aldo Leopold's attitudes toward wildlife changed.
6. Name the first official Wilderness in the United States. When did this happen?
7. What was Bob Marshall's answer to the question? How many Wilderness areas do we need?
8. In one paragraph each: Describe Bob Marshall, Aldo Leopold, Howard Zahniser.
   What did they all share in common? What were their unique contributions for Wilderness?
9. What did the "Dust Bowl" years teach people? How did these attitudes affect Wilderness?
10. What was the greatest threat to wilderness after the Depression?
11. Why do you think *A Sand County Almanac* is such an important book?
12. What was the wilderness movement of the 20th century about?
13. By 1950, how many conservation organizations were there in America?
    What were there concerns regarding wilderness?
14. Explain the controversy and history of Dinosaur National Monument.
    What did the controversy have in common with Hetch Hetchy in the Yosemite Valley?
15. How long did it take to pass the Wilderness Act? How many versions of the bill were there before one passed? How many Congressional hearings were held?
16. What is the National Wilderness Preservation System? What acreage and percentage of the land base in America is currently designated as Wilderness?
17. Will Americans ever be done with the debate over how much land to protect? To develop? Explain your answer.
18. Describe in one paragraph how you felt when you heard the wolf howl.

ECOLOGY

Lesson 1: Stories From a Skull

Objectives:

- Students will identify different parts of a skull and suggest associated adaptations.
- Students will gain an awareness of the relationships between these adaptations, habitats, and community interactions.

Background:

This activity provides hands on connections to wildlife and wild places by providing students with the opportunity to examine skulls. The information and worksheets focus on the characteristics of skulls, as well as the larger picture of how these animals interact in communities based on these visible adaptations. The student/teacher information sheet "Stories From a Skull," serves as background information for this activity.

See Also:

- What Is Wild?—(Primary-Ecology), Page 61
- Creative Movement for Wildlife Species—(Primary-Ecology), Page 73
- Introduction to Skulls—(Elementary-Ecology), Page 147

Activity 1: Skull Detectives

Materials: **Skulls**
copies of "Stories From a Skull" student/teacher information sheets
skulls worksheets one and two
Mammal book for your region
Resource books about your state

Procedure: 1) Introduce skulls as scientific specimens included in the box to promote learning about how some animals live and interact in wild communities. Explain that skulls are difficult & costly to replace and each year several hundred students may be handling them. As appropriate for your group, generate guidelines for skull use.

2) Read and discuss the "Stories From a Skull" information sheet referring to actual skulls as well as noting features on yourself.

3) Ask students to imagine that they are out exploring in the wilderness. They come upon a skull lying on the ground and pick it up to examine carefully. Explain to the students that they should leave skulls where they find them. Divide students into small groups and give each group a skull to investigate. Explain that the emphasis of this part of the activity is on observation, not on identification. Each group should respond to the following questions:

Which features are most noticeable?

Do you think this animal eats plants or meat or both?

Where are the eyes located in reference to the rest of the skull?

Where might your animal live?

Is it similar to any animals you are familiar with?

4) After recording observations and details that led to their conclusions, have small groups report to the class.

5) Complete worksheets and/or have students label their own skull illustrations.

6) Have students research individual species represented by the skulls to create brief species accounts. They should consider the dentition (what the teeth look like); food sources; habitat; and interactions with other species.

7) To reinforce the connections between the adaptive features of skulls described in the information sheet, and the communities within which these species live, create a chart with the individual animals listed down one side and the following headings across the top: "Teeth," "Food," "Habitat," "Predator/Prey," and "Interesting Information." Under each heading have groups illustrate or write brief descriptions of these qualities as they relate to the skull they studied.

8) When all the spaces of the chart are completed, compare and contrast the information, asking students to note any patterns or interconnections between species.

Extensions:

- Create pen & ink illustrations of skulls.
- Measure skulls.
- Imagine a skull was found in a wild place and write a field entry about it because you are going to leave it where you found it.
- Write a story about what a skull would say if it could talk.
- Have blind folded students carefully feel skulls and determine their identity or adaptive features, or have different students feel different parts of a skull and combine their information to help identify it.
- To represent habitats, as containing all the things an animal needs to survive, have students make 'habitat maps' associated with their species. For example a deer habitat might be illustrated by a pond for water, a forest for shelter, and open areas with bushes for food.

Evaluation:

Grade student worksheets.

Create a lab activity where students will identify each skull by species (common and Latin names), genus, family, order, class, phylum, and kingdom.

> *Awaken people's curiosity. Put there just a spark. If there is some good inflammable stuff, it will catch fire.*
>
> —*Anatole France*

STORIES FROM A SKULL

Studying a skull is like trying to figure out a whole story from just a few pieces of information. Observing a skull, we can learn about ways the animal is ***adapted*** to survive in its ***environment***, and its place in a ***natural community.***

The skulls in this collection come from ***mammals***. Although the teeth, sizes, and shapes of the skulls are different, all mammal skulls have two parts. As mammals, you can note these parts on yourself. The ***cranium*** or skull proper is the top part of your head; the ***mandible*** or jawbone, the lower part of your skull. When you put your fingers in front of your ear, and open and close your mouth, you can feel the joint where the cranium connects to the mandible

The different shapes and combinations of teeth in different ***species*** can be used to learn more about the animal's feeding habits. It is helpful to learn some names for types of teeth. Using humans as an example of an ***omnivore***, you can locate them in your own mouth. Begin with the middle two teeth in the front on the top and bottom. These are ***incisors***. Moving back are the single ***canines***, or teeth that would be longer and more pointed if identified in the mouth of a ***carnivore.*** Behind them are the flattened ***premolars*** and ***molars***. When you bite an apple, you use your incisors and canines. When you chew it, you use your molars and premolars.

Carnivores have a mouth adapted for eating meat. They have snipping teeth (incisors), longer tearing teeth (canines) and somewhat pointy grinding teeth (premolars & molars). Look at a carnivore skull, and also notice how the teeth fit together. You can demonstrate this by putting your hands together so that the fingers of one hand fit between the fingers of your other hand. This is the way a carnivore's teeth fit together, as upper and lower teeth mesh.

Looking at ***herbivore*** skulls, there are two main types which are those of ***ungulates***, and those of ***rodents***. Within the ungulate group, members of the deer family (cervidae) do not have upper incisors. Instead, they have a bony ridge used like scissors by rubbing their tongue against it when snipping or browsing on shrubs. Rodents have upper incisors that grow continuously to replace the ends of the teeth worn down by gnawing on rough materials. (Imagine if our teeth grew like this, we would have to file them down every morning!) The front side of these incisors is strong enamel and the back side is softer dentin. If you have a gerbil, mouse, or guinea pig in your classroom, carefully look for these teeth as they chew.

The location of an animal's eyes may indicate whether it is usually a ***predator*** or a ***prey*** species. Predators, like coyotes have eye sockets that face forward for better focus on animals they are hunting. Prey animals, like antelope or ground squirrels, often have eye sockets located more to the sides of their skull. Carefully feel around your eyes for the bones that form your eye socket. You can check the scope of your vision by holding your fingers in front of you, then moving them to the side with your arms straight. Keep your head facing forward, and notice there is a point where you can no longer see your fingers. Eyes and nostrils on top of the skull may indicate that an animal spends much of it's life in the water, like beavers and muskrats.

ECOLOGY - MIDDLE - STUDENT/TEACHER INFORMATION

The length of a mammal's nose, or rostrum, is somewhat related to how much it depends upon its sense of smell. For example, a coyote's nose has about five times the surface area of human noses. For all this smelling surface to fit inside, it must be folded many times. You can observe this by looking inside the coyote skull. The many tiny bones you see are covered with tissues containing cells that receive smells and pass them on to the brain. The more of these cells an animal has in it's nose, the better it can smell. Many carnivores have such a good sense of smell that they can find food that may be far away. Try an experiment with your dog, and see if they can smell a piece of meat hidden in your yard.

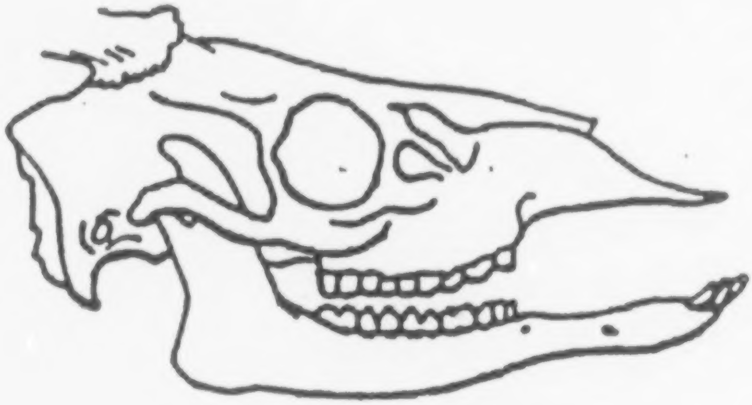
On some herbivores, you will notice bones that grow out of the top of the skull. These ***antlers*** are present on all male members of the deer family including deer, moose, and elk. They are grown by the males each year, and are shed, or lost in the late winter and early spring. Some elk antlers weigh more than 30 pounds each. Imagine carrying 60 pounds on your head! You might want to research just why some animals have this unusual adaptation.

In addition to the presence of antlers, by carefully observing two skulls of the same species, you may note individual differences. Some may be larger or smaller depending on the age of the animal when it died. Age can also be noted by the wear on the teeth. Older animals often have teeth that are flattened or ground down. Imagine the difficulties of an animal that has an injured tooth.

Please handle all skulls carefully so that other students may enjoy learning from them. Thank you!

Vocabulary:

- herbivore
- carnivore
- omnivore
- species
- natural community
- environment
- incisor
- canine
- premolars & molars
- ungulates
- rodents
- mammals
- predator
- prey



Lesson 2: Keys to Understanding

Objective:

- Students will use keys and guides to identify some state wild animals.
- Students will gain an awareness of their own abilities to investigate wildlife and natural features using these resources.

Background:

Wilderness provides a 'natural classroom' as well as reservoir of species that may be observed in their natural communities. An important skill in developing an appreciation for the plants and animals of natural ecosystems is the ability to use keys and field guides. These resources are designed to direct the reader to the particular information they seek by grouping species with like characteristics together.

Once identified it is possible to learn more about the habits, habitats, and life histories of these species using additional library resources.

Activity 1 introduces the use of dichotomous keys, a branching organizational system in which two choices are offered at every juncture of new information. In this activity students model this process using common objects. Here, shoes are sorted into groups "with laces or without laces" just as in identifying a tree in a key the first distinction might be "with needles or without needles". This first breakdown is followed by successively smaller subsets distinguished by different characteristics. The last group contains only one species.

Activity 2 provides experience in using this type of key, **Tree Finder** *for your region, to identify regional trees. Activity 3 involves worksheets designed around a bird field guide, to encourage student use of guides when investigating wildlife in urban or wild environments.*

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary Skills), Page 185
- Wilderness Decision-Making and Group Dynamics (Elementary-Skills), Page 199
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: Introduction to Keys

Materials:
1 shoe from each student
large floor space
note cards

Procedure:
1) Tell students that you are going to create a 'dichotomous key' to identify their shoes and have each student contribute one shoe to a collection on the floor.

2) Ask students to suggest ways the shoes are different from each other and record responses. Select one of these characteristics and sort the shoes into two large groups, for example, those with laces and those without. Each of these groups is then sorted into smaller groups based on different criteria. Continue dividing them until there is only one shoe in each category. A diagrammed example is noted below, though the characteristics you select may vary from this. At each branching point, place a notecard identifying the characteristic used.

- shoes
  - laces
    - white laces
      - high tops
      - low tops
    - colored laces
      - high tops
      - low tops
  - no laces
    - velcro
      - single color
      - multi color
    - slip-ons
      - single color
      - multi color

4) Have individual students think of a particular shoe, without verbalizing which one it is. Other students follow the questioning process of the key, asking only yes or no questions until they discover the identity of the species.

5) Explain to students that the method they have followed for creating a key is one used for identifying plants, animals, minerals, rocks, shells, and many other aspects of nature. Discuss the following:

What is the value of knowing the names of the people in your life? (*Phone calls, letters, talking about them with others, or knowing who they are related to.*)

Why might it be important or interesting to identify things in nature? (*Provides ability to research and learn more about them; medicinal uses; food sources; and interactions with other species.)*

If you were asked to identify a particular plant out of a book containing 300 species, how would the organization of a key assist you in this process? *(Easier than reading through all 300 accounts.)*

Activity 2: Using a Tree Finder

Materials:
samples of trees from your area
Tree Finder from your region
rulers

Procedure:

1) Before the activity collect tree samples for this activity no more than a few days before you are going to use them, as they will dry quickly. Unless you are doing some pruning in your yard, it is not necessary to collect large branches. Each twig should show individual needles or leaves and how they attach to each other or the branch. It is a good idea to identify the samples yourself before the activity. Collect species native to your region or state. Introduced species will not be found in the key.

2) Begin by discussing the values of identifying trees, including referencing the same species in other books and identification of wood types beneficial for certain types of construction. In Wilderness, identification of trees might be for personal interest, investigation of wildlife associated with particular species, or appreciation of different life zones.

3) Ask students to imagine that instead of using shoes, they are going to use a dichotomous key to identify different trees. Introduce the **Tree Finder** from your region.

4) Display the tree samples and ask students to describe some of the differences they observe. (leaves vs. needles; needle clusters vs. single needles; etc.) Demonstrate the use of the key to identify one of the samples.

5) Only one copy of the **Tree Finder** is available in the Wilderness and Land Ethic Boxes. Single copies of the bird and mammal guides are also included. One way to structure your class time is to arrange several investigation centers each with a guide, associated worksheets, and samples or specimens to be identified. (See lesson one involving skulls and the following activity of this lesson focusing on birds.) Small groups of students rotate through these centers. The "Name That Tree" worksheet could be part of a tree identification station.

Activity 3: For the Birds

Materials:
"Bird Book" worksheet
Familiar Birds of North America Audubon Society Pocket Guide
Binoculars (if you have access to them)
Bird field guides (Audubon, Golden Guide, and Petersen's are all excellent)

Procedure:

1) Optional: Begin by telling students that you have just seen a bird, and they are to think of questions they could ask to determine its identity. These may include how big it was; where it was; what it was doing; special markings; and coloration.

2) Review the background information covered in the first section of ***Familiar Birds of North America*** and introduce students to the use of this field guide. Note that bird size, shape, habitat, and markings are the guiding

features of bird identification. Discuss why it might be interesting to be able to identify birds, referencing responses from activities one and two.

3) If possible go on a walk or field trip looking for birds in a variety of habitats. Remind students to move quietly and to listen for bird calls. Also try to investigate a variety of habitats.

4) Have students complete the "Bird Book" worksheet using the field guide at an investigation center, as described in activity two. Answers to the worksheet are as follows: A & 7 = Great Blue Heron B & 3 = Mallard C & 2 = Bluebird D & 1 = Meadowlark E & 4 = Dipper F & 7 = Hummingbird G & 5 = Bald Eagle

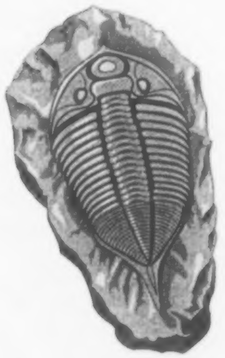
5) Discuss why it might be important for ecologists to be able to identify birds as well as other wild species.

Extensions:

- To support the concept of dichotomous keys, give students small collections of items such as different kinds of beans; nuts, screws and bolts; leaves; crayons; or other items to sort and classify. Have small groups of students create keys similar to the one designed in Activity 1.
- Take walks or field trips to different areas carrying binoculars and field guides. Make journal entries or drawings of that describe what you saw.
- Set aside a location in your room for a "specimen of the day" where a skull, tree sample, photograph, postcard or item from the sensory bag could be placed with associated guides, reference books, or your own questions. Each day students write down and turn in their answers. Keep track of correct responses over a period of several days if you wish to create a classroom competition.
- Keeping a bird list of those you see at your window or using a tape player to record bird sounds are also interesting ongoing activities.

Evaluation:

Grade "Bird Book Worksheet" and "Name That Tree" worksheet.



Thousands of tired, nerve-shaken, over-civilized people are beginning to find out that going to the mountains is going home: that wildness is a necessity; that mountain parks and reservations are useful not only as fountains of timber and irrigating rivers, but as fountains of life."

— John Muir

WORKSHEET #1 - MIDDLE - ECOLOGY

The following Name That Tree *activity is included here as an example. You may wish to develop your own descriptions for trees in your region.*

NAME THAT TREE

Based on the following descriptions identify these Rocky Mountain trees.

1) You are hiking in the high mountains of **your state**, above where most trees grow, in the **subalpine** zone. You note that the trees around you are scrubby and seem to grow horizontally along the ground. When you look at the needles, you find that they are **flat** and cannot be twirled between your fingers. The needles are **not in bunches** and are thick at the base.

____

2) You are walking on a sunny hillside on the **plains** and come to low growing tree that has **scale-like** leaves. You notice **berry-like fruits** that are bright blue. When you open them, you notice they smell strongly, and have more than one seed inside.

____

3) You are backpacking in a Wilderness Area of the Rocky Mountains and come to a windy ridge with trees that are **above 10,000** feet. The trees are in unusual shapes and when you reach for a branch, you discover they have needles in **bundles of 5**. They are about **1 1/2 inches** long.

____

4) If you can see the mountains from your location, you may notice forests that almost come to the plains and grow mostly on the **foothills**. There is a mountain park you often go to and you decide to find out what kind of trees these are. They have needles that are **4-9 inches long**, and are in **bundles of 3**.

____

5) You are walking out on the plains and come to a river that has large trees growing next to it. The leaves of this tree are **triangular in shape**. You notice that in the wind the leaves shake and discover that the **stem is flattened** where it joins the leaf, causing it to shake in the wind. At first you think it may be a quaking aspen, but look more carefully at the leaves and decide it is not, as the leaves are **triangular** in shape, and **over 3 inches long**.

____

◆ Answers:

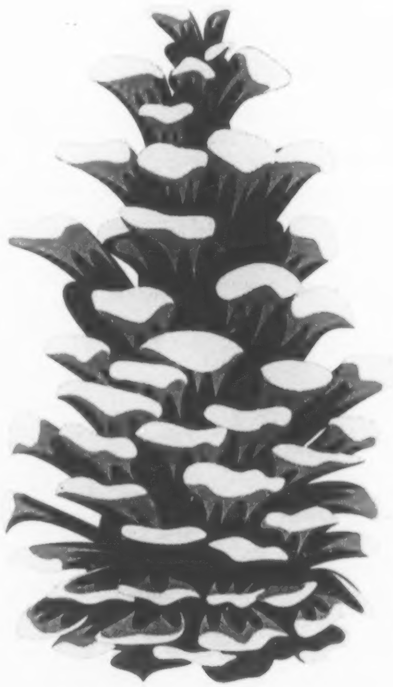
1) ***Subalpine Fir*** *This tree grows at upper elevations in a form called krumholtz, twisted bark. Because of the severe winds and lack of moisture at these elevations, the trees may almost literally, creep along the ground. They often begin their growth in the protection of a log or rock, and in observing them it is possible to identify the direction of the strongest winds.*

2) ***Rocky Mountain Juniper*** *The berries of this tree have a variety of uses in cooking and medicine. Many species of juniper are used in landscaping urban areas.*

3) ***Bristlecone Pine*** *Some of these trees have been dated at more than 4,000 years of age! It is interesting to imagine the changes in the landscape over this time period. Wilderness designation helps to protect these trees.*

4) ***Ponderosa Pine*** *One of the most common trees in mountain parks. The openness of Ponderosa forests makes them easy to walk through and there is usually very little undergrowth. Ponderosa pine bark is often thought to smell like vanilla.*

5) ***Plains Cottonwood*** *Grows along stream beds and rivers. Often reaches great heights and provides important perch and nest sites for a variety of birds.*



BIRD BOOK WORKSHEET

Using "Familiar Birds of North America", find the birds with the following characteristics. Be sure to read about and observe their size, general form, markings or color, habitat, and habits.

A) very tall with wing span of 7 feet, catches fish in shallow water, bluish-gray coloration with yellow bill, nests in tall trees ____________________

B) webbed feet male has bright green head ____________________

C) slightly smaller than robin, bright blue ____________________

D) 8-10 inches long, bright yellow front, straight & pointed bill ____________________

E) small & round, uniformly dark gray, feeds on insects in water ____________________

F) 3 inches long, long thin bill, migrates south in winter ____________________

G) very large white head and tail, hooked bill ____________________

Which bird from the above list does each sentence describe? Birds are used only once.

1) You might see this bird if you were out walking in a meadow, sitting on a low perch singing.

____

2) This bird feeds on insects and tiny grubs. It uses the holes in hollow trees for nests.

____

3) This bird has adapted to life with people and is often seen in city parks.

____

4) You are hiking in the mountains and see a small dark bird hopping in a stream. It is not a duck.

____

5) This species is threatened by pesticides (DDT) that cause their egg shells to become soft. There are now many laws to protect them.

____

6) This bird gets food from the water and cannot survive without wetland areas.

____

7) This bird weighs a little more than a post card. It is adapted for feeding on nectar from flowers.

____

Lesson 3: Ecosystems

Objectives:

- Students will describe a series of specific interconnections between species in a community type.
- Students will recognize the role environmental factors plays in determining community composition of different elevational life zones.

Background:

Lessons 1 and 2 of this strand address the ecological level of species, their adaptations, and habitats. Progressing towards more inclusive concepts, lesson 3 moves from a study of communities, as collections of species interacting in natural habitats; to an awareness of ecosystems as collections of communities interacting with the non-living elements of their environment.

In the mountains, different community types are often associated with different elevational zones. Vegetation and wildlife are affected by environmental factors such as temperature, sun and wind exposure, soil structure, and water availability whose intensity varies with elevation. The culmination of the activity is a representation of an ecosystem.

The Wild Watch Book *and* ***Wilderness Ways*** *in the Wilderness and Land Ethic Box provide additional background information.*

See Also:

- Community Connections—(Elementary-Ecology), Page 141
- Words From the Lorax—(Elementary-Connections), Page 155
- Fire's Role in Wilderness—(Middle-Ecology), Page 279

Activity 1: Life Zone Study Groups

Materials: Review activity and select creating & constructing materials as needed.

Procedure:

1) The information covered in elementary ecology Lesson Two (Page 141) "Community Connections," is a good starting place for this activity. Complete this lesson or review these concepts with your students to provide a basic understanding of communities.

2) From your window or on you school grounds observe different communities, possibly snow covered high mountains and lower foothills or grasslands. Even better...take a field trip to different elevations. Share and discuss the "Rocky Mountain Ecosystems" Information Sheet.

3) Assign each small group to research different state life zone ecosystems. Each project should address plant and animal species, community interactions and the physical environment. Students may use some of the following techniques to present their research findings:

- Mural showing different communities at varying elevations
- Map representing an entire ecosystem.
- Mobile representing community and environmental interactions in an ecosystem.
- Three dimensional model constructed of plaster of Paris, clay, paper mache,

natural materials, recycled materials,...whatever works!

4) Discuss the following: How are these life zones connected? (rivers, weather patterns, migration routes) How might a heavy snowfall one winter at higher elevations, affect lower grassland communities? How do wildlife species use different life zones? How might pollution affect the community interactions of an entire ecosystem?

Evaluation:

Grade student research projects.

Assign students to research different ecosystems representing aquatic, desert, tundra, grassland and savannah. How do these ecosystems differ from those represented in their state?

To the attentive eye, each moment of the year has its own beauty, and in the same field,
it beholds, every hour, a picture which was never seen before,
and which shall never be seen again.
—Ralph Waldo Emerson

Lesson 4: Fire's Role in Wilderness

Objectives:

- Students will define and illustrate the natural role of fire in Wilderness ecosystems.
- Students will demonstrate and draw fire habitats and cycles as they relate to fire and natural communities by completing worksheets, flip books, and fire cycle wheels.

Background:

Ecosystems can be defined as the community of living organisms, environmental factors (see Lesson 3, Page 277), and also the natural processes that perpetuate the interactions of these features over time.

Fire is one of the most dramatic natural processes of any ecosystem. An understanding of the role of fire in natural communities demonstrates that in some ecosystems the health of many communities is directly related to the burning of periodic fires throughout the long term history of an area. The following excerpt from the "Wilderness Awareness Training Module", an Arthur Carhart National Wilderness Training Center publication, explains the approach taken to allow this process to occur within Wilderness ecosystems:

> *"Fire in Wilderness is managed to permit lightning-caused fires to play, as nearly as possible, their natural ecological role within Wilderness, and to reduce, to an acceptable level, the risks and consequences of wildfire within Wilderness or escaping from Wilderness. Naturally ignited fires may be designated and managed as prescribed natural fires in Wildernesses that have approved fire management plans, as long as the fire meets and remains within established criteria. Prescribed fires, ignited by qualified personnel, may be used to reduce fuel buildups within Wilderness, when approved in fire management plans. These plans detail Wilderness fire management objectives for the area, historic fire occurrence, the natural role of fire, expected fire behavior, appropriated suppression action and acceptable suppression techniques, smoke management, and effects on adjacent land owners and Wilderness visitors."*

Activity 1 addresses fire as a source of habitat destruction and creation. After a fire different species use specific habitats created by opening up the forest. As this community develops, other habitats will be created that suit the adaptations of different species. Activity 2 discusses how these habitat requirements fit into the natural cycle of fire, as well as other cycles in the lives of wild species. These activities may be completed in either order.

*Both activities refer to the **"Fire's Role in Nature"** poster. For additional background information please refer to **The Book of Fire** by William Cottrell, an excellent reference for understanding the complex science of fire in simple words and diagrams.*

See Also:

- Community Connections—(Elementary-Ecology), Page 141
- Words From the Lorax—(Elementary-Connections), Page 155
- Ecosystems—(Middle-Ecology), Page 277

Activity 1: Habitats Classified

Materials:
chalkboard
classified sections from newspapers
"Fire's Role In Nature" poster

Procedure:

1) Have students read classified sections from newspapers. Tell them to circle ads for homes or apartments in which they would like to live. Have students share their responses. Record a list of tastes or preferences on the chalkboard. For example, for a student whose ads repeatedly feature pools and large yards, you might write, "likes to swim, needs lots of space". Do this for enough students that a variety of preferences emerge.

2) Introduce the poster "Fire's Role in Nature" and note that the presence of fire in natural communities creates a variety of habitats, that could be compared to the different housing options of the classified section.

3) Identify the different animals and point out that they are illustrated in the habitats that best suit their needs. Some select mature forests, like the hawk whose nest and perch site are located in the tops of old aspen trees. Others benefit from the earlier stages of growth after a fire, like the elk, who forages in open areas.

4) Explain that these animals move between the mixture of habitats created by fires. As forests change over time, animal populations follow these cycles, gradually leaving an area when it no longer meets their needs and returning when it reaches the same point in the cycle, perhaps hundreds of years later.

5) If your students are not familiar with the animals pictured on the poster, you may wish to spend time reviewing and/or researching these species and their habitat requirements.

6) Have students complete the student worksheet "Habitats Classified" found at the end of the lesson. Answers in order of listing: bluebird, hawk, moose, woodpecker, elk, chipmunk, bobcat, grouse

Credit: ***Getting to Know Wildland Fire: A Teacher's Guide to Fire Ecology in the Northern Rocky Mountains***, School Outreach Project of the National Park Service and the U.S. Forest Service. Written by Ellen Petrick-Underwood.

Edited by Joe Zarki. Illustrated by Ellen Meloy.

Extensions:

- Have students create and act out a skit that demonstrates the fire cycle and some of the natural species whose habitats are effected by the different stages.
- Refer to ***The Wild Watch Book*** page 55 for an interesting experiment demonstrating how lodgepole pine cones are adapted for fire.

Evaluation:

Evaluate **"Habitats Classified"** worksheet in Activity 1.

Evaluate completion of flip books or cycle wheels in Activity 2.

Conduct and evaluate pine cone experiment from ***The Wild Watch Book***.

Activity 2: Cycles Behind the Scenes

Materials: **"Fire's Role in Nature"** poster

Illustrating materials as needed

Procedure: 1) Share and discuss the ***Fire's Role in Wilderness*** student information sheet.

2) Ask students to choose three cycles described in the information sheet, or portrayed in the poster, to illustrate. Other examples might include: the seasonal cycle of the chipmunk that hibernates in winter; the water cycle illustrated by the stream; the life cycle of a bee; the life cycles of any of the plants or animals illustrated.

3) Select one or more of the following methods for students to express their understanding.

- Using a circle of arrows show different stages of the cycle
- Staple several small pieces of paper together into a 'flip book' and draw in sequence a different picture on each page, such that when flipped quickly the cycle emerges.
- With a ruler and pencil divide a paper plate into pie-shaped sections corresponding in number with the different stages of your cycle. Illustrate each stage within the section, progressing in a circle around the plate. Cut a small window the size of one illustration in another paper plate. Attach this one over the first with a brad in the center. As one plate is rotated, the stages of the cycle will be seen through the opening in this 'cycle wheel'.

Credit: These activities are taken from ***Getting to Know Wildland Fire: A Teacher's Guide to Fire Ecology in the Northern Rocky Mountains,*** a School Outreach Project of the National Park Service and the U.S. Forest Service. Written by Ellen Petrick-Underwood and edited by Joe Zarki.

Extensions:

- Have students create and act out a skit that demonstrates the fire cycle and some of the natural species whose habitats are effected by the different stages.
- Refer to ***The Wild Watch Book*** page 55 for an interesting experiment demonstrating how lodgepole pine cones are adapted for fire.

Evaluation:

Evaluate **"Habitats Classified"** worksheet in Activity 1.

Evaluate completion of flip books or cycle wheels in Activity 2.

Conduct and evaluate pine cone experiment from ***The Wild Watch Book***.

Extensions:

- Enhance the activity by having students research American Indian fire practices before the skit.
- Create a list of modern uses of fire. Have the students choose a particular use of fire from the list and have them research their topic and make presentations to the class
- Each student can think up a brand new use for fire. Creativity, imagination, and even whimsy are encouraged. Students should make a presentation about "their" new use of fire to the class.

Evaluation:

Students are evaluated on their preparation and participation.

HABITATS CLASSIFIED

Read this classified section. In the space provided below each ad, write in the name of the animal you think would most likely be found in this 'residence'. Hint: All of the animals are pictured in the poster.

- Cozy high rise apartment for summer, monthly lease. Convenient location on migration route. Kids OK.

- Penthouse in burned forest provides comfortable nest site with great view of your neighbors. The hunting is great. Prey can run, but little cover in which to hide.

- Marshy Meadow still has a few undeveloped sites with poor drainage on flood plain location. Tasty sedges and willows plentiful. Must see!!

- Trees! Trees! Trees! All burned! Crawling with insect larvae. Many homesites ready for immediate occupancy. Feed from your own doorstep!

- Recently burned area offers excellent foraging opportunities. Luxuriant undergrowth in open areas. Good cover in forests nearby.

- Do you like seeds? This newly burned location still has good cover but more seeds than you could ever stuff into your cheeks. Don't delay; scurry in today!

- Looking for a secluded den? Rocky Ridge Estates offers the privacy you need with superb year-round hunting nearby.

- Medium age community with open space, sunshine, and young evergreen trees. Fine dining on seeds and berries abounds. Excellent opportunity for occupants with camouflage coloration and ability to remain still.

FIRE'S ROLE IN WILDERNESS

Every 24 hours we observe the cycle of the earth's rotation creating a pattern of day and night. Each year we observe seasonal cycles that cause plants and animals around us to undergo changes based on temperature and food availability. Some cycles take place over a period of time greater than a year, like a pet that is born, grows to maturity, and has young of their own. Other cycles like the appearance of Haley's comet might occur once in our lifetime.

The natural cycle of fire takes an amount of time greater than our lifetime to complete. The fire cycle works in this way: Fires burn the overstory and fallen timber creating new habitats for animals that use abundant grasses, flowering plants, and bushes that grow in sun filled spaces. Leafy trees like aspen extend above the undergrowth. In their shade, evergreens trees grow, and eventually dominate the community. Animals and plants that can use increased cover and loss of undergrowth in this shady evergreen forest will move into the area, until the community returns to a composition of plants and animals whose requirements are met by this last stage. Another fire will start the cycle all over again.

In large ecosystems where fires have burned periodically, a diversity of habitats exist during the same time period and may be used in a variety of ways by different animals. For example, elk that browse in the open areas cleared by a recent fire, may seek shelter in nearby mature evergreen forests.

In the poster **"Fire's Role in Nature"** several cycles of plants and animals are illustrated that overlap with the fire cycle. Deciduous trees like aspen undergo a yearly cycle of growing and shedding their leaves. This helps them to conserve water during the dry months of winter when water is locked up in snow and ice. Pioneer species, such as aspen, often survive fires and produce an abundance of shoots that grow rapidly in burned areas.

The antlers of the bull moose show another yearly cycle. In the spring and summer when antlers are growing, they are covered by a thin layer of skin, or velvet, with a rich blood supply. When this is cut off at the end of the summer, the velvet is rubbed off. In the contest for mates, bull moose may lock antlers, but they rarely injure each other. Moose retain their antlers into winter, usually shedding them between December and February. New growth begins this cycle again, in the spring. Moose feed on water plants found in marshy areas and streams and the undergrowth of bushes that grow in aspen groves and other open habitats.

The illustration of the bluebird represents two cycles. One is the life cycle beginning with the eggs in the nest cavity of the aspen tree. The other is simply the presence of the bluebird in this northern forest scene. Representing a seasonal migration cycle, the western bluebird will fly to the southwestern US and northern Mexico to spend its winters, returning each year to forest habitats, to make its nest. Migratory cycles are a source of fascination to scientists and naturalists alike. Consider the several thousand mile journey taken twice a year by this bird that weighs less than a pound.

Find the bee in the poster. It is shown gathering nectar on the white flowers of the cow parsnip plant. In the process, it will pollinate the flowers so that seeds will be produced, beginning the cycle of seed to plant to flower to fruit to seed again. Generally found in moist open areas, the starchy roots of the cow parsnip are an important food source for grizzly bears in the summer.

Even the charred stumps of the poster represent a part of the nutrient cycle that will eventually benefit new seedlings as now-burned nutrients from the once living tree are returned to the soil and 'recycled'. The larvae of insects that lay their eggs beneath the bark of burned trees provide a food source for birds like woodpeckers whose numbers increase in response to this food source. What other cycles can you notice in the poster?

The examples of cycles within nature are evident all around us. To imagine the fire cycle, we need to extend our time frame to cover two to three hundred years, remembering that perceived "devastating" effects of fires are only a brief glimpse of a much longer natural cycle in which other cycles operate promoting the health of the ecosystem over time. Fire, like the plants, animals, and environmental factors, is an integral part of wilderness.

CONNECTIONS

Lesson 1: Acid Rain & Wild Places

Objective:

- Students will simulate the affects of acid rain on wilderness.
- Students will evaluate how acid rain might affect wilderness and invent solutions.

Background:

The effects of acid rain on wilderness are a great concern and these effects are being studied by researchers. Some research involves cameras located at strategic points and programmed to take photographs several times a day to monitor the amount of visible pollution in the air. Other studies have focused on the impact acid rain has on living organisms. This lesson promotes understanding of the ways in which the water cycle, topography, and air pollution combine to create acid deposition in wilderness.

Acid rain may be explained as one result of 'interactive' pollution. It starts with fossil fuel combustion mostly from power plants and cars. Sulfur dioxide, originating mainly from coal-burning power plants, and nitrogen oxides, from both power plants and cars, are the gases contributing to acid rain. Once in the air, these gases combine with water droplets and form sulfuric and nitric acids. The acids can fall as rain or snow, or they can hover near the ground as fog. Acid "rain" can even fall to earth as dry particles or acid "deposition." In this way, pollution from urban centers may be transported to higher elevations and precipitate into mountainous areas.

The elementary strand provides an introduction to the concepts of water cycles and air pollution. It may be helpful to review these topics as they relate to your community and proximity to wilderness.

In this lesson several experiments simulate the effects of acid rain on plant growth, water pH, and soil acidity. pH paper is used to measure relative acidity by changing color in different substances. The colors are associated with numbers of the pH scale. This scale ranges from 0-14 with 1 very acidic and 14 very basic. pH 7 is considered neutral. The logarithmic representation of this system means that there is a 10 fold differences between numbers in the scale. For example, a substance with pH of 4 is 10 times more acidic than that of 5. A slight variation in numbers can represent a large difference in the actual acidity of the substances.

*The **"Acid Rain Experiments,"** a student information sheet provides descriptions of the materials, procedures and evaluative responses for each experiment, so students can perform the experiments themselves. "To Grow or Not to Grow" requires observations over several days and could be monitored concurrently with other lessons. "The Big Chill" and "Soil Stuff" may each be completed in a single class period allowing time to discuss the relationship between observations and the impacts of acid rain on natural ecosystems.*

See Also:

- Wild Air/City Air—(Elementary-Connections), Page 159
- Wild Water—(Elementary-Connections), Page 163
- Water: Wet and Wild—(Middle-Connections), Page 293

Activity 1: Acid Rain Investigations

Materials: As described in **"Acid Rain Experiments"** student information sheet

pH papers, you can order from biological supply companies. Be sure to order wide range (1-12 or 0-14) pH hydrion paper, 4-5 rolls for 25 students.

Procedure:

1) Collect materials needed for each experiment.

2) Introduce students to the information covered in "Background" section.

3) In small groups, or as a class, use pH paper to identify the pH of some common liquids. Dip the paper in the solutions, then match to the color chart. Some solutions are lemon juice (pH2), vinegar (2-3), cola soft drink (4), tap water (5), milk (6), baking soda & water (7).

4) As demonstrations or in small groups complete the experiments described in **"Acid Rain Experiments"** student information sheet.

5) Conclude each experiment by guiding discussions based on the following information. You may also wish to have students respond in writing to some of the questions. Discuss how the study of acid rain relates to effects on a Wilderness that is near your area.

To Grow or Not to Grow

The seeds watered with distilled water should have sprouted first and grown the most. The seeds watered with the acidic solution should have sprouted later or not at all. Those that did sprout might have had yellow or stunted leaves. (Remind students that the acidic solution *simulated* acid rain, which generally has a pH of about 4.) Many scientists think that acid rain may affect trees, which live longer and can be exposed to acid rain for many years, by weakening them and making them more vulnerable to stress. For example, acid rain may increase a tree's susceptibility to drought, disease, and insect attack. It may also cause certain essential minerals in the soil to dissolve and wash out, causing the trees and other plants to grow more slowly.

How might this aspect of acid rain influence wilderness ecosystems and the natural communities they preserve?

The Big Chill

The pH of the water should have become lower after the acidic ice cubes melted, while the pH of the water with the distilled ice cubes should not have changed. The surge of acidic water from sudden snowmelt. represented by the ice cubes made from the acidic solution, can cause a drastic drop in pH. This sudden jump in acidity, called "spring shock," can kill certain species of fish. It also interferes with the reproduction of fish and other aquatic animals. For example, most fish, salamanders, and frogs lay their eggs in the early spring - just about the time spring shock occurs. The eggs and young of these species are very sensitive to acidity and are often killed by the sudden increase in acidity. If the eggs survive, the young that hatch may be deformed.

Soil Stuff

The pH of the solution poured through the sphagnum moss should have stayed the same. The solution poured through the potting soil should have become less acidic. Results for the soil taken from your area will vary, depending on the pH of your soil. The potting soil, which is significantly less acidic than the solution, acted as a buffer: it neutralized some of the acid in the solution. The sphagnum moss is more acidic and didn't neutralize the acids in the solution. If the pH of the solution poured through the soil from your area remained the same, your soil is probably acidic. If the pH increased, your soil is probably alkaline. Differences in soil types can help explain the varying effects of acid rain. In areas with deep, alkaline soils, acidic rain and melt water slowly trickles through the soil and is neutralized before it reaches lakes and streams.

Other areas, such as alpine ecosystems, have little soil development with relatively thin acidic soils. Acid rain runs into lakes and streams without being neutralized, adding to the acidity of lakes in these regions. Many forms of aquatic life exist within a relatively narrow pH range. How might the change in the acidity of the soil affect these organisms?

Credit: Adapted with permission of the *National Wildlife Federation, from the* ***Pollution: Problems & Solutions*** *issue of Naturescope, Copyright 1990.*

Extensions:

- Take the pH of an aquarium or fish bowl, stream or pond near your school, and dirty puddle in a parking lot. Record and compare results.
- Follow a stream upstream and measure acidity as you get closer to the source.
- Contact the National Geographic Society at 800-368-2728 to find about "**Kidsnet**," a computerized acid rain information exchange program.
- For more information about an acid rain monitoring program sponsored by the National Audubon Society, write to the Citizens Acid Rain Monitoring Network, 950 Third Ave., New York, NY, 10022.
- Invite representatives from county, state and federal agencies to speak to your class about acid rain and water quality.

Evaluation:

- Grade written responses to questions presented in Procedure, Section 5.
- Research potential job opportunities that relate to wilderness management, and water and air quality.
- Ask students to write a response paper to the question: How does acid rain affect wilderness?

ACID RAIN EXPERIMENTS

To Grow or Not to Grow

Materials: Seeds (radish, pea, or clover will work best), large container, distilled water, 20 empty milk cartons, potting soil, marker, masking tape, vinegar, ruler, measuring cup, pH paper

What to Do: 1. Fill the 20 milk cartons 3/4 full with potting soil. Plant one seed in each.

2. Label 10 of the cartons with "A" for acid and 10 with "DW" for distilled water.

3. Make a solution with a pH of about three by mixing one cup of vinegar with four cups of distilled water.

4. Measure the pH of the distilled water and record it. Water the seeds in the "DW" cartons with distilled water and the "A" cartons with acidic solution. Put the cartons in a sunny spot indoors.

5. Over the next three weeks water all the seedlings with the appropriate water whenever they look dry. Make sure to give each seedling the same amount of water. Record the date each seed sprouts and measure the heights of the seedlings every few days thereafter.

What Happened? Which seedlings grew the most? Which grew the least?

Think About It: If acid rain has about the same acidity as the acid solution you used, how might it affect plant growth?

The Big Chill

Materials : Two ice cube trays, distilled water, lemon juice, freezer, pH paper, two containers. marker, masking tape, measuring spoon & cup

What to Do: 1. Take the pH of the distilled water and record it. Then pour enough distilled water into an ice tray to make 3 ice cubes. Label the tray "DW" for distilled water and put it in the freezer.

2. Add 1 1/2 teaspoons of lemon juice to 2/3 cup of distilled water to make a solution with a pH 3. Pour enough of the lemon-juice solution into an ice tray to make three ice cubes. Label the tray with "A" For acid and put it in the freezer.

3. Once the ice cubes have formed, pour the same amount of distilled water (about three cups) into each container.

4. Put the three distilled-water ice cubes into one of the containers and let them melt. Then put the three ice cubes made from the acidic solution into the other container and record the results.

5. After the ice cubes melt, stir both solutions. Then take the pH of the liquid in each container and record the results.

What Happened? What was the pH of the water in the containers after the ice cubes melted?

Think About It: In some areas of Colorado, acid snow falls during the winter. In early spring, the snow that has fallen throughout the winter melts and runs into lakes and streams. Using the results of this demonstration, how might the acidic snowmelt affect the pH of lakes and streams? How might this affect the organisms in the lake?

Soil Stuff

Materials: Sample soil from your area, potting soil, sphagnum moss, funnel, filter paper, vinegar, distilled water, measuring cup, large container, and pH paper

What to Do:

1. Make up a solution with a pH of about three by adding one cup of vinegar to three cups distilled water.
2. Put a piece of filter paper into a funnel. Fill the funnel about two-thirds full with the moss.
3. Put the funnel over a large container, then pour the acidic solution into the funnel.(Make sure you don't add too much liquid all at once). Wait until all the liquid has collected in the container below the funnel.
4. Take the pH of the liquid that collects in the container.
5. After rinsing out the funnel and container and removing the used filter paper, repeat the experiment twice using potting soil instead of sphagnum moss and then using the soil from your area. (Be sure to rinse the equipment between uses.)

What Happened? Did the pH of the liquid change after you poured it through the sphagnum moss? The potting soil? The soil from your area?

Think About It: In some areas, where acid rain falls, lakes and streams don't show the effects of acid rain. In other areas where acid rain falls, lakes and streams have become acidified. Why?

Lesson 2: Water: Wet and Wild

Objective:

- Students will demonstrate the relative scarcity of fresh water on the planet.
- Students will illustrate the basic concepts of the water cycle and understand the role Wilderness plays in preserving a continuous supply of fresh water.
- Students will understand the concept of a watershed and be able to identify one on a topographic map.

Background:

The water cycle is a basic ecological concept. Human survival is fundamentally dependent on the integrity of the water cycle, and Wilderness plays a critical role in preserving this integrity. Understanding patterns such as the water cycle will enhance a student's understanding of the natural world and humans' relationship to it.

Finally, a concrete understanding of the concept of a watershed should help to clarify the importance of human activities in conserving water.

The first activity is a simple demonstration of the scarcity of fresh water on earth. The debriefing at the end is critical in making the point that water is a valuable resource and human activities impact the distribution of water.

See Also:

- Wild Air/City Air—(Elementary-Connections), Page 159
- Wild Water—(Elementary-Connections), Page 163
- Acid Rain and Wild Places—(Middle-Connections), Page 287

Activity 1: Bag of Water

Materials:

A 5-gallon bucket or plastic bag

Measuring cup, pitcher, two smaller containers, measuring spoon

Labels for each container

Procedure:

Ask individual students to complete the following steps:

1. Fill a bag or bucket with 5 gallons of water.
2. Take out two cups and place it in the pitcher. This is labeled *"all fresh water."* The rest is in oceans.
3. From the two cups, place 1 1/2 cups in a smaller container. This is labeled *"freshwater in ice caps and glaciers."*
4. From the 1/2 cup remaining in the pitcher, take out 1/4 teaspoon. What is left in the pitcher should be labeled *"all deep ground water."*
5. The 1/4 teaspoon is labeled *"all freshwater lakes."*
6. Of the 1/4 teaspoon take out one drop. This represents *"all the freshwater streams and rivers"*.

7. As a class, discuss the concepts of limited and renewable resources. Where does fresh water come from? Is there "enough" of it? What kinds of natural and human activities tend to conserve fresh water? What kinds of activities tend to use more or disperse fresh water? Can deserts be "made"?

Activity 2: Water Cycles

Materials:

Paper,

Pencils,

Chalkboard

Water Cycle Poster

Procedure:

1. Ask students to draw a drop of water, representing a drop from the kitchen faucet.

2. Next, student trace back the drop of water counter-clockwise to places it has been on its journey to the faucet. At each stage students can draw a picture. Perhaps the municipal water system draws from a lake, the lake is fed by a river, which is made up of many mountain streams, which are formed by spring runoff, etc. Encourage them to use their imaginations! Where does this water come from? This exercise will require approximately 10 minutes.

3. Place the **Water Cycle Poster** in the front of the classroom. Lead a discussion using the diagram to explain the water cycle. Emphasize the importance of water in our daily living. What is the role of Wilderness in the water cycle? The rich, spongy organic soils and shady forest overstory help to slow down the snow melt in spring, providing for a continuous supply of running streams and fewer floods.

Activity 3: State Watersheds

Materials:

Trails Illustrated topographic map.

access to a duplicating machine

magic markers or crayons

Procedure:

1. Find an example of a watershed on one of the topographic maps in the box. Make enough copies of this section of the map so that each student has one.

2. Ask students to color all the streams on the map. This may require some assistance since the streams on duplicated maps will look much like contour lines. The key difference is that streams run perpendicular to contour lines. Which way are all these streams running? Which way is downhill? You might ask students to draw a small arrow next to each stream to indicate direction and flow.

3. The final step requires an understanding of contour lines on the part of at least some of the students. Ask students to draw a boundary around the area

where rain falls into the streams they have colored. They should try to be as precise as they can, following the ridgelines and peaks of the watershed.

4. Discuss. Good questions include:

How large might the stream be at the foot of the watershed in late spring? How about in late summer?

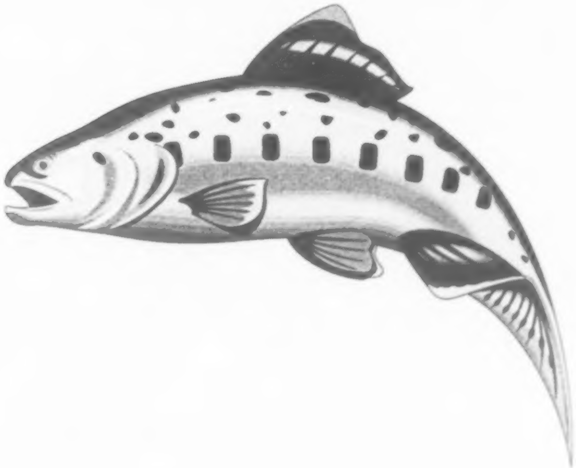
Is this watershed forested?

What human activities are going on in the watershed? How would they impact the streams?

Credit: The *Bag of Water* activity was adapted from the North Carolina Outward Bound School's ***Earth Book.***

Extensions:

- Various experiments are possible to demonstrate the enhanced capacity of organic soil with vegetative cover to retain water. Pour equal amounts of water into three shallow trays filled with organic soil, clay, and sand. Place them in a sunny window sill, and check them each day for moisture content.
- Visit a place with lush vegetation on a dry day, and let students explore for water. Then visit a place devoid of vegetation (the school playground, perhaps), and again explore for water. Discuss the differences.
- Ask students to explain the water cycle using the **Water Cycle Poster.**
- Refer to the Wild Water Lesson found in Elementary-Connections (Page 163). The activities may be adapted for middle school.



Lesson 3: Wilderness Management

Objective:

- Students will recognize that there are many perspectives from which to view land management decisions.
- Students will define some of the challenges faced by land managers.

Background:

Knowledge gained from other strands as well as the background information provided in the introduction pages serves as background for this lesson. In this lesson students are asked to incorporate their knowledge of the ecological systems, aesthetic values, and human connections with Wilderness to gain a perspective of the multifaceted issues facing professional land managers today.

See Also:

- Wilderness Decision-Making and Group Dynamics—(Elementary-Skills), Page 199
- Judgment and Decision-Making—(Middle-Skills), Page 347

Activity 1: You Manage

Materials: Background information from Introduction section of the curriculum and student information sheets.

Procedure: 1) Review some of the societal, economic, and environmental implications of Wilderness using examples from lessons in Aesthetics, Connections, and Ecology Strands. In this activity students will be asked to take the role of land managers. They will be making decisions that are similar to those faced by professionals in this field, who recommend and administer Wilderness management practices and principles.

2) Present the scenario described in the "You Manage" information sheet.

3) Working in small groups or individually, have students list the areas in the order that they would have them designated Wilderness. Remind students that there are no "right" or "wrong" answers in this activity, and that they should be prepared to discuss with others the reasoning behind their decisions.

4) Conclude by comparing responses after time has been given to discuss the scenario. Some guiding questions follow:

- What special concerns were considered?
- Which aspects of the scenario presented particularly difficult choices?
- If you worked in a group, did individuals have specific concerns about the areas? Were personal experiences or family background involved?

Evaluation:

Ask each group to submit in writing their reasons for the ranking order of each proposed wilderness. Evaluate their responses. Students can make a "pro's" and "con's" list for each proposed wilderness.

YOU MANAGE WILDER NATIONAL FOREST*

You are a land manager for the Wilder National Forest. In keeping with the concept of ecosystem management, the boundaries of this forest have been established along the continental divide and include the entire Wilder Creek watershed. The boundaries extend eastward onto the plains at lower elevations and include a variety of life zones and communities from the plains to the alpine.

Currently there are three proposed wildernesses in your Forest. Each area is approximately 5,000 acres in size. Studies have been conducted in each area to determine the scientific value. A public comment period brought 3 stacks of letters, of equal height, to your desk. Each area has a strong citizen's group promoting the idea that increased protection will be gained by designating it as a Wilderness.

1) Antelope Flats is an area on the plains that contains one of the last sections of tall grass prairie in your state. Some rare grasses are found here along with a threatened species of lily. Antelope use this area extensively throughout the year. Letters from the League of Plant Conservationists urge the protection of Antelope Flats as they believe this unique ecological community and threatened species of lily will require federal protection to preserve its specific habitat needs.

2) The Ancient Quarry area is located in the montane life zone and includes a site used historically and prehistorically by tribes coming to the area to collect chert for arrowheads. Letters from the tribal council and from a group of interested archaeologists support the addition of the ancient quarry site. They state that it is of tremendous cultural value as it provides insights into the lives of people long ago. Though it is illegal to remove artifacts from this area, it is within an area frequented by mountain bikers whose trails cross through the quarry site.

3) The Alpine Vistas area is located almost entirely in the alpine life zone and includes trails to the tops of three 14,000 foot peaks. Currently there are jeep roads in this area that take groups of tourists over high passes with spectacular high mountain scenery. The Western Hiking Club has written urging you to establish this as a Wilderness that will provide for the protection of sensitive alpine communities and provide an experience of quiet and solitude.

You are asked to prioritize these three areas for their inclusion into the National Wilderness Preservation System under the jurisdiction of the U.S. Forest Service. You may take into account issues of economics, societal values, and environmental quality when making your decision.

* All names used for places and organizations are fictitious.

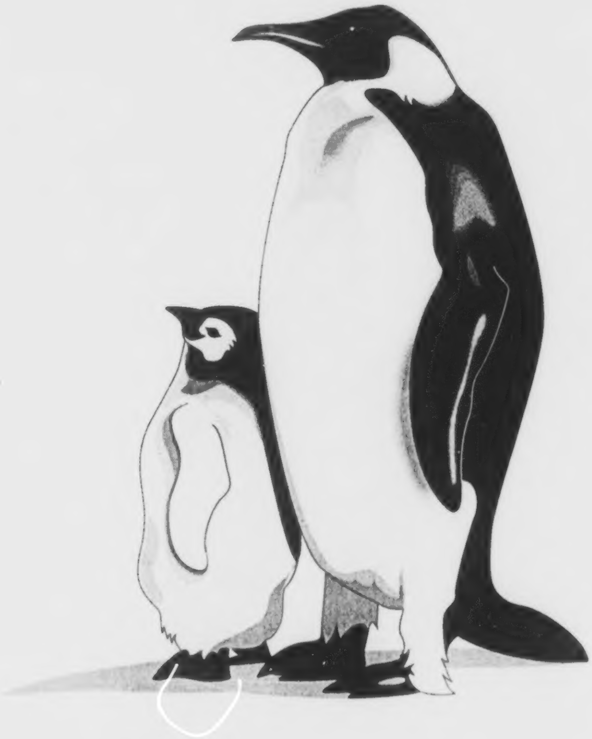
Activity 2: Stake It Out

Background:

Stake It Out activity is divided into 3 parts. Part 1, the Land, introduces a forest area that students will have to decide how to use. The second part, Consequences, shows the possible outcomes of each land-use plan the students might choose. Combing Uses (part 3) is an ending that discusses combining more than one use in the same forest area. The video is divided into two sections. The second section provides essential support for this activity.

Materials: **"Green Scene"** video curriculum is in brown accordion folder in Wilderness and Land Ethic Box.

> *The grand show is eternal. Eternal sunrise, eternal sunset, eternal dawn and gloaming, on seas and continents and islands, each in its turn, as the round earth rolls.*
>
> *—John Muir*



WILDERNESS: DEFINITIONS, VALUES AND BENEFITS

"Although not every person who worked on this bill will agree with each and every provision, one thing we all have in common is a love for Wyoming and a desire to preserve and protect Wyoming's unique natural features and way of life."

-Statement from Rep. Dick Cheney introducing Wyoming Wilderness Act

Definition

"A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled (uncontrolled) by man, where man himself is a visitor who does not remain." It is "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which

1. generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable;
2. has outstanding opportunities for solitude or a primitive and unconfined type of recreation;
3. has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired conditions;
4. may also contain ecological, geological or other features of scientific, educational, scenic, or historical value."

Purpose

"In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does nor occupy and modify all areas...leaving no lands designated for preservation and protection in their natural condition...."

Values and Benefits

1. **Recreation** (Re-creation of the mind, body and spirit)
    a. Improved performance—place of challenge where one can discover and develop inner resources. Solitude can enhance creativity.
    b. Physical and mental health
    c. Self-esteem, confidence
    d. Self-sufficiency, independence
    e. Spiritual values, Inspiration
    f. Develop outdoor skills including hunting and fishing
    g. Intra-group intimacy, build team work

2. Scenic

a. The area is internationally renown for its scenic value
b. Aesthetics inspire art, music, literature
c. People can re-connect with natural beauty

3. Scientific

a. Ecological benchmark to assess impacts in more developed settings Baseline for global monitoring
b. Study how natural systems function—interactions, evolution
c. Study people's relation to land—how can we better harmonize activities?

4. Educational

a. Outdoor classroom where one can learn about nature first-hand
b. Learn skills to live more simply and more self-sufficiently in everyday life

5. Conservation / Preservation / Non-utilitarian

a. Ecosystem preservation. Species biodiversity. Maintain planet health
b. Preservation of gene pools, carbon bank
c. Right of other species to live freely
d. Preserves future options—don't know how whole planet works, so shouldn't disturb now
e. Bequest to future—pass on some wild places to future generations
f. Refuge for many species that depend on large, remote, undisturbed areas

6. Historical

a. Part of our natural character.
b. Tie with our history—reminder of what the frontier meant in shaping a national culture
c. Maintains traditional, primitive skills
d. Archeological resources tell valuable story about human survival in harsh environments

7. Quality of Life

a. Improved air quality due to lack of development and filtering action of green plants
b. Steady flow of water to downstream areas, reduces floods and provides places to recharge aquifers (water supply)
c. Clean, relatively pure water (quality)
d. Helps maintain open space. Limits urban sprawl

8. Economic/Commercial

a. Outfitter/Guide Businesses

b. Domestic livestock grazing

c. Commercial art and photography

d. Potential place to collect gene stocks - seeds and tissue of wild plants for propagation. Already plant and animal species existing in their natural states have played major roles in the development of heart drugs, antibiotics, anticancer agents, and anti-coagulants. More than 23% of all prescriptions sold in America each year contain active ingredients from plants.

e. Tourism and rural growth. A national survey on migration into Western wilderness counties found that, while populations in most rural communities were declining in the 1980's, counties with Wilderness were continuing to grow. Scenery, outdoor recreation opportunities, environmental quality, peaceful life and limited development potential were reasons people were moving to the counties. 55% of the residents felt wilderness was an important reason for living in the area, while 72% of the migrants considered it a major factor in their decision to move to the area.

Reference: Rudzitis, G. and H.E. Johansen. 1989. Migration into Western Wilderness counties: causes and consequences. Western Wildlands. 19(1):19-23.

SKILLS

Lesson 1: Basic Map and Compass

Objective:

- Students will understand common U.S. Geological Survey map symbols including contour lines.
- Students will use a compass to read bearings in the field and from a map.
- Students will orient a map.
- Students will triangulate with a map and compass to determine their location.
- Students will explain and demonstrate triangulation using a map and compass.
- Students will use a map and compass out in the schoolyard, park or wild place.
- Students will locate a point where two azimuths cross.

Background:

Map and compass skills are some of the most difficult outdoor skills to learn, but they can be among the most satisfying. As with other elements of the Wilderness and Land Ethic Box, this lesson is not intended to be a comprehensive curriculum in orienteering, but rather, a basic introduction to those map and compass skills that will be most useful in beginning wilderness travel.

*Included in the Wilderness and Land Ethic Box are the national and state wilderness maps, a state road map with national forests indicated, and several **"Trails Illustrated"** maps which combine U.S. Geological Survey topographical information with management information from the Wilderness management agencies. Before you present this lesson, it is recommended that you do **Overview, Lesson 2: Where is Wilderness** (Page 215), to orient students to different types of maps and their uses. You might also wish to consider **Basic Map Skills** from the Elementary Wilderness Skills strand (Page 177) , if your students have little familiarity with the concept of maps.*

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary-Skills), Page 185
- Wilderness Decision-Making and Group Dynamics—(Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: Map Symbols Bingo

Background:

A **map** is "a reduced representation of a portion of the surface of the earth" (Kjellstrom, 1976, p. 8).

A topographic map is a map that shows the three dimensional features of the land's surface in two dimensions. "Topos" = place; "Graphein" = to write or draw (Kjellstrom, 1976).

Where to purchase maps—U.S. Geological Survey, and local sporting goods or map stores.

Materials:

Trails Illustrated Map
One copy of the Map Symbols legend (located at end of lesson)
Map Information sheet (at end of lesson)
Map worksheet
Scissors
Rulers
Paper
Pens
A hat or other container for bingo symbols

Procedure:

1) Prior to the beginning of the activity, cut up one set of symbols to be drawn out of a hat in the bingo game.

2) Introduce the **Trails Illustrated maps** by dividing students into groups, giving each group a map to look at. Ask them to tell you what they notice about this map that is different from others they have seen. Some will mention the funny brown squiggly lines, but others may point out the small pictures of bicycles, tents, or dashed lines. Highlight the symbols list on the front of the map, and go through the symbols one by one, so that students focus on them enough to learn what they stand for. Have them try to find examples of some symbols on the map itself.

3) Now it is time to play Bingo. Each student will need to draw a "bingo card", four boxes wide by four boxes tall on a piece of paper. Each student should cut out individual pictures of all the map symbols, and place any 16 in any order in the boxes, one in each box. No fair attaching the name of the symbol to the picture. The point is to learn what the symbols stand for! If you think cheating may be a problem, students can glue symbols onto boxes.

4) Select symbols randomly out of your hat in the front of the room, and read off the name of the symbol, e.g., "mountain bike route", "Wilderness boundary", or "Unsurfaced Road-High Clearance". Students mark an "X" over that symbol on their card. The winner is the first to correctly identify four symbols in a row. You might wish to play several rounds, or continue playing until everyone wins. Debrief at the end by asking if there are any symbols that anyone is still confused about.

Evaluation:

Test students on defining each map symbol they have learned about in the Bingo game, or use the enclosed map worksheet with a map, and evaluate.

Activity 2: Reading the Land—Contours!

Materials:

Plastic Mountain and Tank
A one-foot square piece of clear plastic sandwich wrap
Crayon, felt tip marker
Food coloring
Water, measuring cup
Trails Illustrated topographic maps
Contour lines worksheet and quiz

Procedure:

1) Show students the topographic maps again, and remind them about the brown squiggly lines. Explain that contour lines are lines that represent elevation. In other words, if a person were to walk along such an imaginary line, she would never climb or go downhill. It would always be level or flat. Contour lines are a way of illustrating three-dimensional changes in topography, such as mountains and valleys, on a two-dimensional picture—a topographical map.

2) To illustrate this concept, get out the plastic mountain. Add a little food coloring to about 3 1/2 quarts of water. Begin by pouring 1 quart into the mountain's tank. There should be a small hole in the top of the mountain to release air so that the mountain can be partially submerged in the water. With a crayon, draw a line at the "shoreline" where the water touches the mountain. Explain that if a tiny person were to walk on this line, he would never go up or down the mountain, but always walk on the level.

3) Put the lid on the container, and cover it with the plastic wrap. Point out to the students that if you look directly down through the lid, it is possible to trace the line on the mountain exactly onto the lid. Have students do this in small groups.

4) Next pour two more cups of water into the tank and repeat the above steps. Continue filling and drawing, both on the mountain and on the lid until the mountain is submerged. Remove the sandwich wrap "map" from the lid, and place it on top of a piece of white paper next to the mountain. Ask students to compare the shapes of the contour lines with the shape of the mountain. What happens to the lines as the mountain becomes steeper? (Be sure you have added exact equivalent amounts of water to the tank on each repetition!) What do the lines do as they cross a valley? A ridge? Why is it important to know how much water was added each time, in other words, what was the contour interval?

5) Finally, return to the topographic maps in small groups. Ask students to examine mountains, cliffs, ridgelines and valleys. Ask them to describe which way streams are flowing. Trace a stream all the way from its source to its exit off the map.

Evaluation:

Photocopy a section of a topographic map with a variety of land features. Ask students to label five to ten land features.

Handout the Contour Lines worksheet and the Contour Line Quiz following this lesson.

Activity 3: What is a Compass?

Materials: **Silva Starter Compasses** (one for each two students in the class is ideal)

Coins or other small objects

The Compass Parts Student Worksheet (at the end of this activity), and Compass: An Introduction Student/Teacher Information Sheet.

Procedures: 1) The basics of Bjorn Kjellstrom's classic book ***Be Expert with Map and Compass*** are summarized on the pamphlet enclosed with the Silva Starter Compasses in the Wilderness and Land Ethic Box. Read through this before conducting this activity.

2) Give each student a copy of the Student Worksheet, Compass Parts. Start with the concept of direction. Direction is defined as the line of travel or sight from point A (present location) to point B (destination) (Drury and Bonney, 1992). Direction is expressed in terms of the 360 degrees of a circle. Any direction can be expressed in terms of the degrees of an angle measured clockwise from a point at the top of the circle to the point on the circumference representing the direction. True North has been universally defined as the top of the circle.

3) Next, describe the parts of a standard protractor compass, the most common compass used in wilderness travel in North America. The baseplate is the rectangular, transparent piece of plastic on which all the compass parts rest. The direction of travel arrow is engraved or painted on the baseplate and points toward the intended destination. Compass bearings or degree readings are taken from the point where the base of the direction of travel arrow touches the numbers on the edge of the compass housing. The compass housing is the circular, rotating rim found in the middle of the baseplate. It has the initials of the four cardinal points: N, S, E, and W on the outer rim, as well as degree readings in between. The magnetic needle is suspended on a bearing in the middle of the liquid-filled, plastic-cased housing. This needle points to magnetic north when the compass is held steady and level. The orienting arrow and lines are painted on the housing and point to the 360/0 degree mark. The primary function of the compass is to assist the backcountry traveler in establishing the direction of North and thereby measuring the angle or "bearing" of the intended line of travel to the

destination.

4) A good initial exercise with compasses is taking and following field bearings. A field bearing is the angle of the line of travel established when the compass alone is used to sight a destination in the field. First have students squarely face the distant point that is to be the destination and hold the compass at chest height with the direction of travel arrow pointing toward the destination. Orient the compass by turning the compass housing until the orienting arrow rests squarely over the magnetic needle, so that the needle points to North on the housing. Make sure that only the housing is turned, not the baseplate. Read the bearing at the intersection of the direction of travel arrow with the housing.

To follow the field bearing, students should identify a clearly visible landmark to which they know they can walk without losing sight of it for more than a few minutes, and which is on the same bearing as the destination. By moving from one landmark on the bearing to another, students can proceed along the line of travel without constantly following the exact path indicated by the compass, so that they can move around obstacles.

5) A second exercise is to have students select a bearing and follow it for a measured number of steps, say 40, on the school grounds. Before they begin, they should drop a penny at the beginning point. At the end of the first leg, add 120 degrees to the bearing and count off another 40 steps. Then add 120 degrees again and walk a third 40 steps. Because they are 360 degrees in a circle (120 x 3), the students should have walked a perfect equilateral triangle and finish to find their penny at their feet!

Activity 4: Bearings with Map and Compass

Materials: U.S. Geological Survey 7 1/2 minute quadrangle topographic maps of the study site (one for every four students is ideal)

Compasses

Combining Map and Compass Student/Teacher Information Sheet

Procedure: 1) First, teach students how to orient the map. When observing terrain features in the field, it is frequently helpful to line up the map so that it faces the same way as the terrain. Orienting the map is easy to do with the compass. Rotate the baseplate until the direction of travel arrow is pointing to North on the housing, or to the angle of declination for the area if you choose to teach this. Place one of the long side edges of the baseplate along either of the north/south margins of the map. Turn the map, with the compass on it until the magnetic needle is completely within the orienting arrow. Both the compass and the map are now oriented.

2) The compass can be used as a protractor when attempting to establish a bearing for travel from one known place on a map to another. Place the

edge of the baseplate along a line from the current location to the destination with the direction of travel arrow pointing toward the destination. Rotate the housing until the orienting arrow and lines are exactly parallel with the meridian lines on the map. Read the bearing from the intersection of the direction of travel arrow with the housing as usual.

3) If you wish to translate the map bearing taken above to the field in order to actually travel to the destination, you will need to decide whether to teach about the angle of declination. Declination is the difference, expressed in degrees of an angle, between the location of True North (as found on a map) and that of Magnetic North (as shown by a compass) measured from a specific location on the earth (Drury and Bonney, 1992). If your students are studying map and compass skills in more depth, and you want them to understand declination, the Silva brochure discusses it in sufficient depth for you to teach it. The basic rule for locations with declination east is this: Map Bearing - Declination = Field Bearing; Field Bearing + Declination = Map Bearing.

4) Translating field bearings to map bearings is a great way to finalize students' skills in using maps. Try to choose a site for this with some obvious relief nearby: Hills or mountains, bluffs, vistas of streams, etc. Have students identify their current location on the map first. Then they can pick a landmark in the field they wish to identify on the map, and shoot a field bearing to it. Add the angle of declination to it if you are teaching about that. Then use the compass, with the direction of travel arrow set at the appropriate bearing, as a protractor to find the line from current location on the map to the landmark. Of course, you won't know exactly how far out that line the landmark is, so students will need to use contour lines and other map symbols to complete the estimation.

Activity 5: Triangulation with Map and Compass

Materials:

7 1/2 minute Maps of Area

One compass for each participant or group

Pencil

Procedure:

1. Using a topographic map of the area, positively identify two or three known landmarks that can be seen both in the field and on the map.
2. Take a field bearing of landmark #1. Write this bearing down and convert it to a map bearing. (Be sure to consider the area's declination.)
3. Set the compass for the map bearing of landmark #1.
    a. Place the edge of the compass base plate with the "direction of travel" arrow facing landmark #1 on the map.
    b. Keeping the front tip of the base plate on landmark #1, rotate the compass base plate around the landmark until the orienting arrow and the orienting/meridian lines are pointing to True North/South on the map.
    c. Pencil in a line on the map along the compass base plate edge that touches landmark #1. (This line may have to be extended.)

   d. The present location lies somewhere along this bearing.

4. Repeat the same procedure for landmark #2 and landmark #3.
   a. Once all three bearings are recorded on the map, the lines should intersect or at least form a small triangle at some point on the map. This location is the approximate spot from which the three bearings were taken (i.e., the present location).
   b. Participants should not be discouraged if the lines do not meet precisely at some given point. Given the level of sophistication of normal compasses and the participant's skill level, an approximate location should suffice to satisfy the need to know "where we are."

Activity 6: Map and Compass Field Exercises

Background:

This activity consists of four different field exercises: A. Schoolyard Compass use; B. Compass Competition; C. Go Around; and D. Locate fire.

A. Schoolyard Compass Use

Materials: **Compass** (one for every student or one for a group of three)

Stakes set up in a large circle marked I, O, U, L, Z, E, A, and P

Pencil

Student/Teacher Information Worksheets for each field exercise

Procedure: 1. Practice setting the compass for degree bearings and follow them with precision.

2. Group Project: The course consists of eight marked stakes set up in a large circle. The stakes are marked I, O, U, L, Z, E, A, and P.

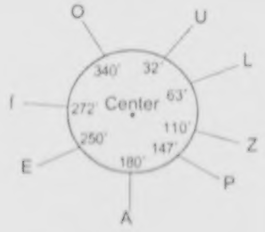


Figure 1

The course for the Schoolyard Compass Game consists of eight stakes placed at the same distance but at different compass bearings from a center stake. To play the game, each participant is provided a compass, pencil, and instructions. The instructions tell the trainee to follow five compass bearings from marker to marker around the course. Use the section following the Student Compass

Worksheet located at the end of this lesson.

1. Start at stake marked A. Proceed 305, 29, 100, 162, 221. Markers reached:________

2. Start at stake marked E. Proceed 358, 68,140, 198, 252. Markers reached:________

3. Start at stake marked I. Proceed 42, 112, 178, 236, 305. Markers reached:________

4. Start at stake marked O. Proceed 100, 162, 221, 287, 358. Markers reached:_______

5. Start at stake marked U. Proceed 140, 198, 252, 320, 42. Markers reached:________

6. Start at stake marked L. Proceed 178, 236, 305, 29, 100. Markers reached:________

7. Start at stake marked Z. Proceed 221, 287, 358, 68, 140. Markers reached:________

8. Start at stake marked P. Proceed 252, 320, 42, 112, 178. Markers reached:________

9. Start at stake marked A. Proceed 320, 68, 162, 236, 305. Markers reached:________

10. Start at stake marked E. Proceed 29, 112, 198, 287, 358. Markers reached:________

B. Compass Competition

Materials:

Compass
Measuring tape
Cord with tags number one to 20
Compass Competition Student Worksheet

Procedure:

1. This activity uses compass bearings and measures distances by pacing. This type of compass competition is particularly suited for school grounds and campsites. The course can be set up quickly, remain in location, and large numbers of pupils or campers can try their compass skills under the direct guidance of their teacher or leader.

2. Group Project: Before the start of this compass competition, each participant needs to know the length of his or her pace. The compass course for the competition consists of 20 markers placed five feet apart on a straight magnetic East-West line. Number the markers consecutively from one to 20, with number one on the most Westerly marker. An alternate, and simpler, method is to tie loops in

the ends of a piece of binder twine or strong cord, 100 feet apart, and tie tags numbered from one to 20 on the cord, five feet apart. Next stretch out the cord between two pegs in an East-West direction, with number one on the West end. When ready to start, each participant is provided with a compass and with instructions telling him or her at what mark to start and how to proceed. Use the following Compass Competition worksheet located at the end of this activity.

Start at Point 1, Proceed: 36 degrees for 122 feet, then 149 degrees for 58 feet, then 235 degrees for 86 feet. Destination reached: No._____.

Start at Point 2, Proceed: 17 degrees for 104 feet, then 150 degrees for 52 feet, then 142 degrees for 64 feet. Destination reached: No._____.

Start at Point 3, Proceed: 38 degrees for 125 feet, then 237 degrees for 90 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 4, Proceed: 36 degrees for 122 feet, then 174 degrees for 50 feet, then 228 degrees for 74 feet. Destination reached: No._____.

Start at Point 5, Proceed: 22 degrees for 107 feet, then 158 degrees for 54 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 6, Proceed: 3 degrees for 100 feet, then 132 degrees for 74 feet, then 225 degrees for 69 feet. Destination reached: No._____.

Start at Point 7, Proceed: 34 degrees for 119 feet, then 186 degrees for 50 feet, then 228 degrees for 58 feet. Destination reached: No._____.

Start at Point 8, Proceed: 346 degrees for 102 feet, then 129 degrees for 78 feet, then 211 degrees for 58 feet. Destination reached: No._____.

Start at Point 9. Proceed: 346 degrees for 102 feet, then 129 degrees for 78 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 10, Proceed: 343 degrees for 104 feet, then 141 degrees 64 feet, then 145 degrees for 61 feet. Destination reached: No._____.

Each participant goes to the marker that has the number that corresponds to the starting point on his or her instructions. When finished, the trainee writes down the number of the destination marker. All the routes lead back to markers on the course line. If the player reaches the correct destination, he/she receives a score of 100 points. Otherwise, the judge deducts one point for each foot of error, or five points for each marker from the correct one. Run the game three times with different starting points for a possible maximum score of 300 points.

C. Go Around

Materials: **Compass** for group of students
Building or obstacle outside

Pencil
Paper to mark bearing and distance

Procedure: This activity practices traversing around an obstacle. Layout a course toward the center of one side of a building. Traverse 90 degrees four times until you are on the original line of sight on the opposite side of the building. For example:

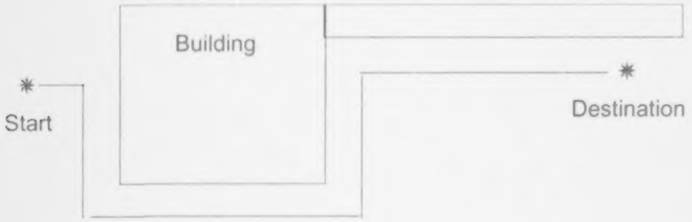


Figure 2

	BEARING	DISTANCE		BEARING	DISTANCE
A.			D.		
B.			E.		
C.					

Mark a point on the sighting line at the destination that is hidden from the participants.

Credits: There are many excellent books and curricula in orienteering and map and compass work. The three that have been most helpful for this lesson are:

Kjellstrom, B., *Be Expert With Map and Compass: The Orienteering Handbook* (New York: Charles Scribner's Sons, 1976).

Drury, J. and Bonney, B., *The Backcountry Classroom* (Merrillville, IN: ICS Books, 1992).

McNeill, C., Martland, J. and Palmer, P., *Orienteering in the National Curriculum* (Doune, Perthshire, Scotland: Harvey's, 1992).

Extensions:

- If you use U.S.G.S. quadrangles as topographic maps, there is considerably more information on the maps themselves than we have presented so far. You might wish to discuss longitude and latitude, the system of quadrangles maintained by U.S.G.S., map scales, or ways topographic maps are made and checked.
- If your students do well with translating field bearings to map bearings, you might wish to teach

triangulation, the technique of using bearings on known landmarks to identify current location on the map. The technique is discussed in the above references, and a simplified version is presented in the Silva brochure in the Wilderness Box.

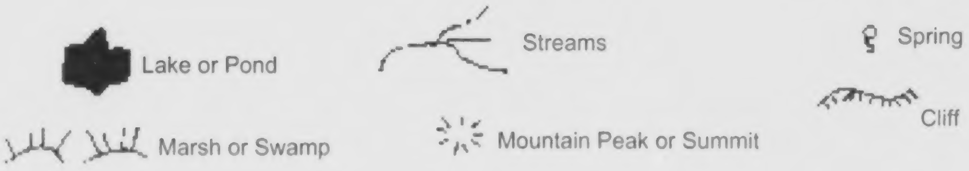
- Another wonderful extension is a field trip doing off-trail route finding with map and compass. This is when the skills really matter.
- Triangulation is best taught on treeless mountain tops or at least in areas of open visibility where clearly distinguishable landmarks can be seen.
- For practice, participants can triangulate an already known (present) location.
- The instructor can provide bearings to identify a hypothetical "unknown" location on the map.
- Participants should attempt to locate their approximate position at some convenient time on a trailless hike using triangulation.

Evaluation:

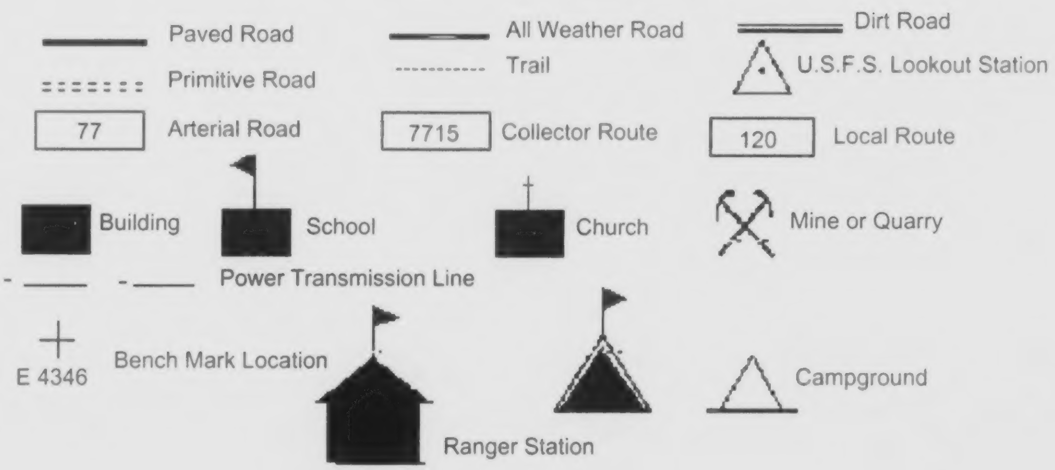
Set up an orienteering course on the school grounds, nearby park, or natural area. Locate points (on the ground) that students will have to find (and identify on a worksheet) using map and compass skills they have learned in this lesson. Consult resource people or books to assist you with any or all of the activities in this lesson.

MAP SYMBOLS

Natural Resources


Lake or Pond
Streams
Spring
Cliff
Marsh or Swamp
Mountain Peak or Summit

Human-Made Improvements


Paved Road
All Weather Road
Dirt Road
Primitive Road
Trail
U.S.F.S. Lookout Station
77
Arterial Road
7715
Collector Route
120
Local Route
Building
School
Church
Mine or Quarry
Power Transmission Line
E 4346
Bench Mark Location
Ranger Station
Campground

MAP INFORMATION SHEET

1. Map Margin Information

Identify each of the following:

A. Name of the map

B. Names of adjacent maps

C. Location of the map on the earth's surface

   i. Longitude, note meridians

   ii. Latitude, note parallels

D. Date of the map – Note possible changes that may have occurred since the map was drawn and field tested.

E. Map scale/series – Note how the scale is drawn.

   i. Scale ratio

   inches/cm. on map = inches/cm. in the field

      a. 1:24,000

      This map is good for detailed study of a small area.

      1 inch = 2,000 feet in field

      Approximately 2½ inches = 1 mile

      1 cm. = 240 m., 4 cm. = 1 km

      b. 1:25,000

      Used in metric series, similar to 1:24,000 scale

      1 cm. = 250 m

      c. 1:62,500

      Good general purpose map

      Approximately 1 inch = 1 mile in field

      1 cm. = 625 m., 1.5 cm. = 1 km

   ii. Series

      a. 15" (minute) series

      This map covers a section of the earth's surface 15" of longitude x 15" of latitude. Note longitude and latitude marks on map to confirm size.

      b. 7½" series

      Note that it takes four 7½" maps to equal a 15" map.

      c. 7½" x 15" series

      Metric series found only in a few areas of the United States

2. General Map Details

Identify the location of each detail on a sample map.

A. Map symbols

- i. Cultural symbols – symbols of human-made objects. These are represented by the color black.
  - a. Roads
  - b. Railroads
  - c. Churches
  - d. Trails
  - e. Buildings
  - f. Cemeteries
  - g. Bridges
  - h. Schools
  - i. Quarries/mines
- ii. Water symbols – represented by the color blue
  - a. Lakes
  - b. Streams
    - (1) On 7½" maps, for a stream width of more than 40 ft. (12 m.), both shores are shown.
    - (2) On 15" maps, for a stream width of more than 80 ft. (24 m.), both shores are shown.
  - c. Springs
  - d. Marshes/swamps
- iii. Map directions
  - a. True north

    This is the north that is shown on a map.
  - b. Magnetic north

    This is the north that attracts the compass needle. Subsequent navigation lessons ("Compass: An Introduction" and "Combining the Map and Compass: An Introduction") will discuss the two norths and declination in more detail.
  - c. Place name designations

    Note the different styles of lettering used for area names, elevation figures, political boundaries.

B. Elevation markings – These are represented by the color brown.

- i. Contour lines

  "An imaginary line on the ground along which every point is at the same height above sea level" (Kjellstrom, 1976, p. 23). Note the altitude numbers located along some contour lines.

a. Index contour

Heavier brown contour lines usually spaced at 100 ft. elevation intervals

b. Intermediate contours

The contour lines between index contours

c. Contour interval

The distance in height between one contour line and the one next to it (Kjellstrom, 1976, p. 23). Intervals vary from map to map.

b. Contour shapes

(1) Hills & mountains

(2) Passes

(3) Steep areas

(4) Flat areas

c. Depression contours

d. Interpreting elevation change

(1) Contours forming V's generally point uphill.

(2) Streams which come together forming V's generally point downhill.

e. Benchmarks

"BM" represents the location of a marker in the field where altitude or distance has been verified. The number next to "BM" indicates altitude.

SKILLS - MIDDLE - WORKSHEET #1

MAP WORKSHEET

A. NATURAL FEATURES

1. Locate a river on the map.
    a. What is its name? ________ _________
    b. Name a stream flowing into it. __________________

NOTE: Dashed lines at the origin of a stream indicate that it has intermittent flow.

2. Identify:
    a. a spring __________________
    b. a lake __________________
    c. a mountain peak __________________
    d. a marsh or swamp __________________

A. HUMAN-MADE IMPROVEMENTS

1. On your 1/2" scale map, identify by number:.
    a. an arterial road ________________
    b. a collection road ________________
    c. a local road ________________
    d. a trail ________________

2. Identify by name:
    a. a campground ________________
    b. a bench mark location ________________

CONTOUR LINES

1. A contour line, by definition, is an imaginary line on the ground along which every point is at the same height above sea level.
2. The number on a contour line indicates elevation above sea level. Locate a contour line on Figure 2 and write it down ______________________. Write down the number of the contour line next to it ________________________.
3. The distance in elevation between one contour line and the one next to it is the **contour interval**. The vertical distance between the contour lines on Figure 2 is ____ feet.
4. Contour lines indicate elevation, slope steepness, level areas, tops of hills, saddles, and ridges.
5. When contour lines cross a river or stream, they take on a V-shape, with the point of the V pointing uphill.
6. Contour lines denoting a ridge of a hill become U-shaped, with the bottom of the U pointing downhill.

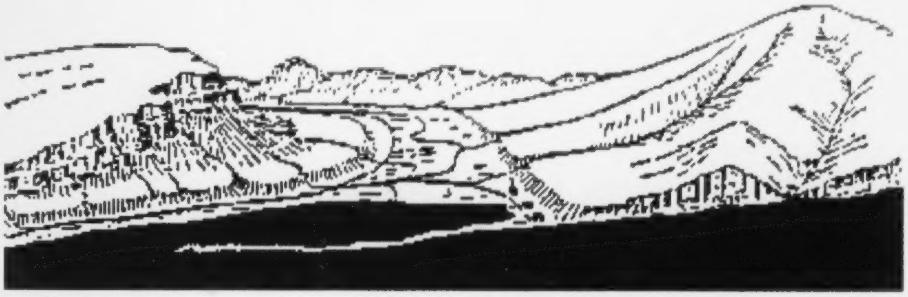


Figure 1 - A Landscape in Perspective

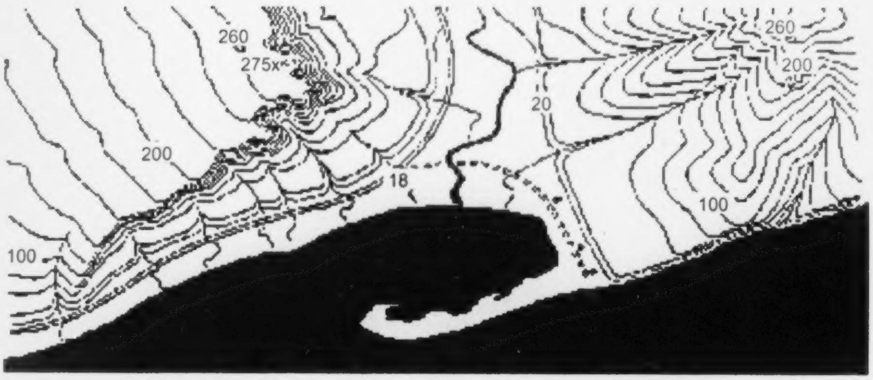
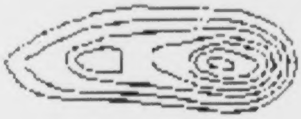


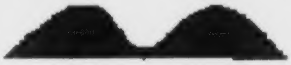
Figure 2 - The same landscape with contour lines.

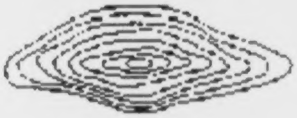
SKILLS - MIDDLE - WORKSHEET #3

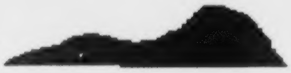
CONTOUR QUIZ

Match the profile (A-F) with the contour lines (1-6)

1


A


2


B


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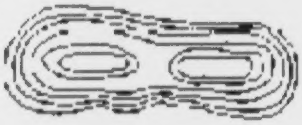
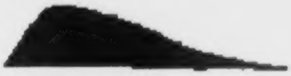
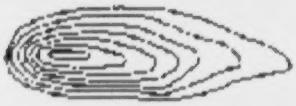


C


4


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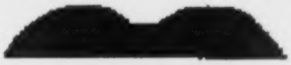
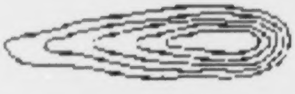
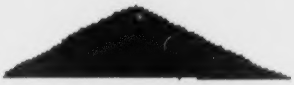
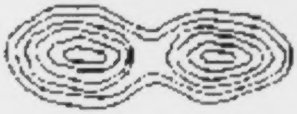
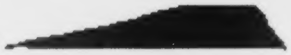


5


E


6


F


1. ______

2. ______

3. ______

4. ______

5. ______

6. ______

COMPASS PARTS

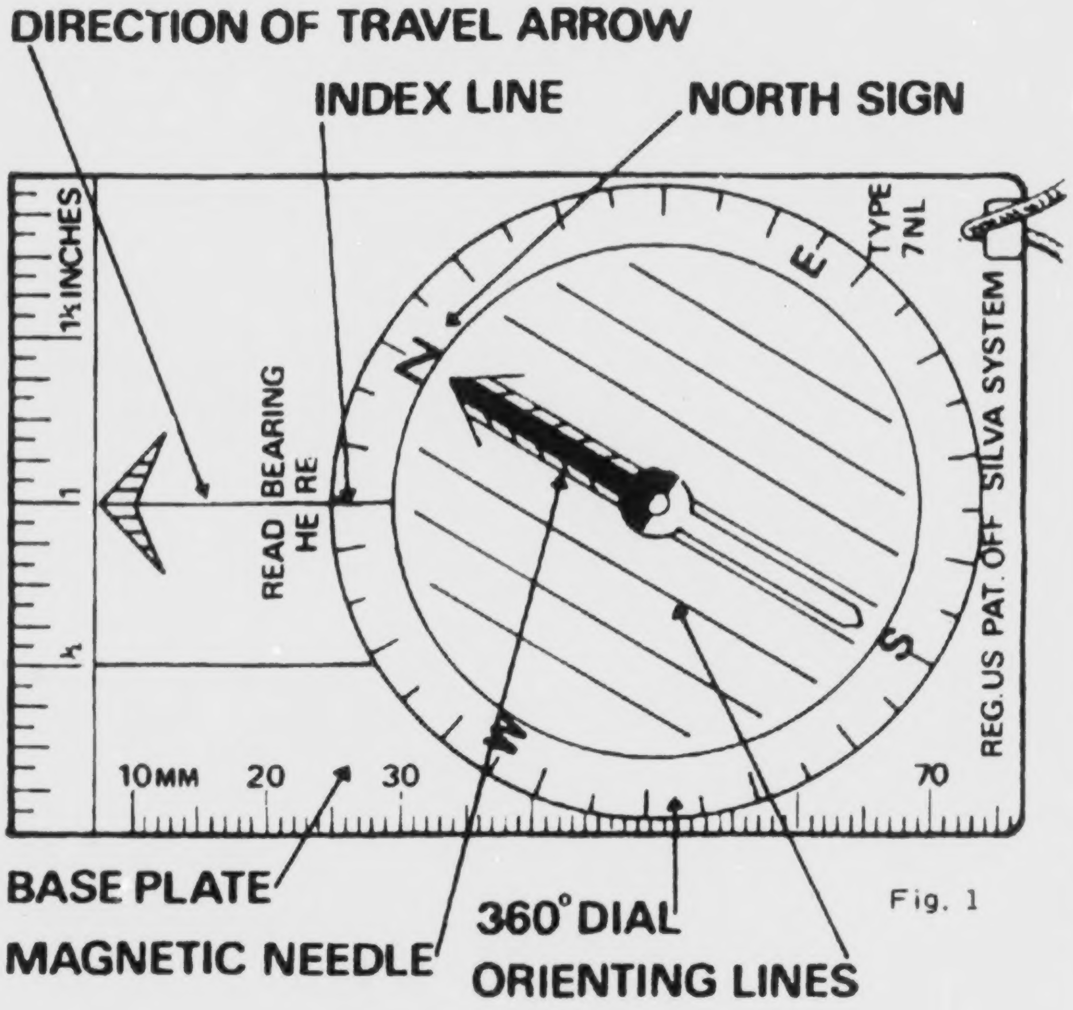

DIRECTION OF TRAVEL ARROW
INDEX LINE
NORTH SIGN
1½ INCHES
1
½
READ BEARING HERE
N
E
S
W
TYPE 7NL
SILVA SYSTEM
REG.US PAT. OFF
10MM
20
30
70
BASE PLATE
MAGNETIC NEEDLE
360° DIAL
ORIENTING LINES

Fig. 1

COMPASS: AN INTRODUCTION

A. Concept of "Direction"
   1. Direction is defined as the line of travel or sight from point A (present location) to point B (destination).
   2. Direction is expressed in terms of the 360 degrees of a circle.
      a. Present location is assumed to be the center of the circle.
      b. Any direction can be expressed in terms of the degrees of an angle measured clockwise from a point at the top of the circle to the point on the circumference representing the direction.
      c. For two or more people to describe a direction to each other accurately, they must establish a common "top of the circle" from which degrees will be measured. True North has been universally identified as the top of the circle. Give examples of directions N, S, E, and W in degrees.

B. Parts of the compass (based on the Silva™ Polaris Type 7 & similar compasses)
   1. Base plate
      a. The rectangular, transparent piece of plastic upon which all compass parts rest.
      b. This plate typically has millimeter and inch markings along the edge for measuring.
      c. The edges of the base plate are parallel to the "direction of travel arrow," which is engraved upon it.
   2. "Direction of travel" arrow
      a. Engraved arrow on the base plate which runs from the edge of the compass housing to one end of the base plate.
      b. Compass bearings or degree readings are taken from the point where the base of the direction of travel arrow touches the numbers on the edge of the compass housing.
      c. Whether using in the field or on a map, the direction of travel arrow must always point toward the intended destination.
   3. Compass housing
      a. Circular, rotating rim found in the middle of the base plate.
      b. It has the initials of the four cardinal points, N, S, E, and W on the upper rim, and degree lines on the outer rim.
      c. Most compasses have lines representing increments of 2° of angle with every twentieth degree numbered. Some smaller compasses have only 5° increments.
   4. Magnetic needle
      a. The magnetic needle is suspended on a bearing in the middle of the liquid-filled, plastic-cased housing.
      b. This needle points to Magnetic North when the compass is held steady and level.

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5. Orienting arrow and orienting/meridian lines
    a. Usually in blue or white, these are represented by the outline of an arrow. They are also the parallel lines engraved in the plastic bottom of the housing.
    b. The arrow points directly to the 360°/0° mark on the compass housing.
    c. The compass is said to be "oriented" or "boxed" when the compass housing is turned so that the magnetic needle lies directly over the orienting arrow, and both the arrow and the needle simultaneously point to the letter "N" on the compass housing rim.
    d. The orienting lines run parallel to the orienting arrow and are used in establishing map bearings.

C. Function of the Compass
1. The magnetic needle of the compass always points to Magnetic North. This provides a constant and common reference point (360°/0°) from which all directional degree designations may be measured.
2. By facing True North, then pointing to an intended destination (B in Figure A), an imaginary angle is formed by the line pointing True North and the line pointing to the destination. The meeting point of these two legs of the angle is the observer's present location (A in Figure A).

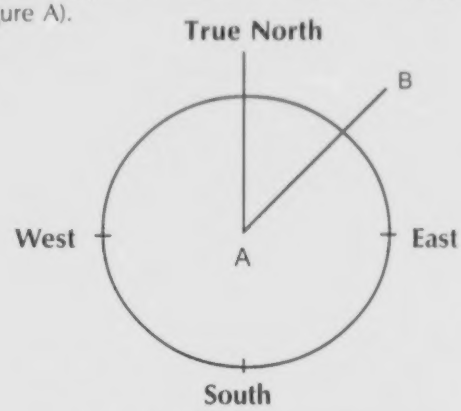

Figure A The Compass Bearing

3. The primary function of the compass is to assist the backcountry traveler in establishing the direction of North and thereby measuring the angle or "bearing" of the intended line of travel to the destination.

COMBINING MAP AND COMPASS: AN INTRODUCTION

I. Philosophy

Once experience has been gained with maps and compasses separately, the two skills can be combined to maximize their potential. However, it's important to keep in mind that when used together, both should be relied upon and not one without the other.

- A. Use the map to find easier routes that are close enough to the original bearing and the destination. Don't blindly follow a bearing that goes through swamps and up cliffs.
- B. Don't take the easiest route if it contradicts the bearing.
- C. Generally speaking, when in doubt, rely on the bearing. The terrain can be deceiving while a correct bearing is generally not.

II. Using Map and Compass

- A. Taking a map bearing
  - 1. The compass may be used as a protractor when attempting to establish a bearing for travel from one known place on a map to another.
  - 2. Place the compass on the map with one of the long edges of the base plate connecting the starting point of the trip with the destination. Be sure the "direction of travel" arrow is pointing in the direction of the destination.
  - 3. Twist the compass housing until the orienting arrow and the meridian lines (or "map aid" lines) within the housing are parallel with the nearest north/south longitudinal line (meridian) on the map.
    - a. The only true North/South lines are those printed on the map margins (and the "ticks" that mark the "neat" lines). It's important to understand that the grid lines on a map are not true North/South meridian lines. It's best to use the edge of the map or any line parallel to the edge for taking a map bearing.
    - b. Be sure the orienting arrow is pointing to True North at the top of the map.
  - 4. Read the map bearing from the rim of the housing where it intersects with the direction of travel arrow. This reading is called a "map bearing," i.e., the angle measured in degrees formed by a line of travel on a map in relationship to True North (top of map).
  - 5. Some like to draw parallel north/south lines on the map in pencil to ensure accuracy when taking bearings, although, as will be seen shortly, a better method may be employed.
- B. Declination: using a map bearing
  - 1. This is a good time to introduce declination because before understanding how a map bearing can be used in the field as a guide for travel, declination must be taken into consideration.

2. Declination is the difference, expressed in degrees of an angle, between the location of True North (as found on a map) and that of Magnetic North (as shown by a compass) measured from any given location on the globe.
   a. The declination for any given area is recorded on the bottom of that area's map.
   b. This measurement must be checked and accounted for before wilderness travel by map and compass is undertaken.
3. If, as is the case for much of the eastern U.S., Magnetic North is located some degrees west of the North Pole (True North), then:
   a. Declination + Map Bearing = Field Bearing

      For instance, in New York State the average declination is 14°, therefore 14° must be added to any map bearing in New York before it can be used accurately in the field. (The reverse would be done west of 0° declination: Declination - Map Bearing = Field Bearing.)
   b. Field Bearing - Declination = Map Bearing

      Again, in New York State with an average declination of 14°, 14° must be subtracted from any field bearing before that measurement can be accurately used to find a location on a topographic map. (The reverse would be done west of 0° declination: Field Bearing + Declination = Map Bearing.)
4. Drawing pencil lines parallel to Magnetic North/South (i.e., parallel to the margins) across the map will eliminate the need to add or subtract when taking map bearings. However, this method is discouraged until participants have a thorough understanding of why and when to add or subtract when taking map bearings and plotting field bearings.

C. Orienting a map with the compass

1. When observing terrain features in the field, it is frequently helpful to line up the map so that it faces the same way as the observer. This lining-up of the features of the map with those in the field is known as orienting the map.
2. Orienting the map can be easily accomplished with the compass.
   a. Set the compass "direction of travel" arrow at the appropriate declination for the area.
   b. Place one of the long side edges of the compass base plate along either of the north/south margins of the map. Make sure the "direction of travel" arrow is heading in a northerly direction.
   c. Turn the map, with the compass on it, until the magnetic needle is "boxed" by the orienting arrow. Both the compass and the map are now oriented.

SCHOOLYARD COMPASS WORKSHEET

1. Start at stake marked A. Proceed 305, 29, 100, 162, 221. Markers reached:________

2. Start at stake marked E. Proceed 358, 68,140, 198, 252. Markers reached:________

3. Start at stake marked I. Proceed 42, 112, 178, 236, 305. Markers reached:________

4. Start at stake marked O. Proceed 100, 162, 221, 287, 358. Markers reached:_______

5. Start at stake marked U. Proceed 140, 198, 252, 320, 42. Markers reached:________

6. Start at stake marked L. Proceed 178, 236, 305, 29, 100. Markers reached:________

7. Start at stake marked Z. Proceed 221, 287, 358, 68, 140. Markers reached:________

8. Start at stake marked P. Proceed 252, 320, 42, 112, 178. Markers reached:________

9. Start at stake marked A. Proceed 320, 68, 162, 236, 305. Markers reached:________

10. Start at stake marked E. Proceed 29, 112, 198, 287, 358. Markers reached:________

COMPASS COMPETITION WORKSHEET

Start at Point 1, Proceed: 36 degrees for 122 feet, then 149 degrees for 58 feet, then 235 degrees for 86 feet. Destination reached: No._____.

Start at Point 2, Proceed: 17 degrees for 104 feet, then 150 degrees for 52 feet, then 142 degrees for 64 feet. Destination reached: No._____.

Start at Point 3, Proceed: 38 degrees for 125 feet, then 237 degrees for 90 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 4, Proceed: 36 degrees for 122 feet, then 174 degrees for 50 feet, then 228 degrees for 74 feet. Destination reached: No._____.

Start at Point 5, Proceed: 22 degrees for 107 feet, then 158 degrees for 54 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 6, Proceed: 3 degrees for 100 feet, then 132 degrees for 74 feet, then 225 degrees for 69 feet. Destination reached: No._____.

Start at Point 7, Proceed: 34 degrees for 119 feet, then 186 degrees for 50 feet, then 228 degrees for 58 feet. Destination reached: No._____.

Start at Point 8, Proceed: 346 degrees for 102 feet, then 129 degrees for 78 feet, then 211 degrees for 58 feet. Destination reached: No._____.

Start at Point 9. Proceed: 346 degrees for 102 feet, then 129 degrees for 78 feet, then 186 degrees for 50 feet. Destination reached: No._____.

Start at Point 10, Proceed: 343 degrees for 104 feet, then 141 degrees 64 feet, then 145 degrees for 61 feet. Destination reached: No._____.

Each participant goes to the marker that has the number that corresponds to the starting point on his or her instructions. When finished, the trainee writes down the number of the destination marker. All the routes lead back to markers on the course line. If the player reaches the correct destination,he/she receives a score of 100 points. Otherwise, the judge deducts one point for each foot of error, or five points for each marker from the correct one. Run the game three times with different starting points for a possible maximum score of 300 points.

Lesson 2: Wilderness Nutrition and Cooking

Objective:

Students will identify special nutritional requirements of wilderness travel, be able to light and manage a backpack stove, and prepare several recipes.

Background:

Good food plays an especially important role in the success and enjoyment of a wilderness outing. It is essential for staying healthy, maintaining body tissue, and providing energy, mental alertness and a positive attitude. In selecting rations for a trip with given length and objectives, the wilderness traveler must consider energy content, nutritional balance, bulk and weight, spoilage, expense and availability, ease of packaging and handling, variety, and preparation time. There must be a balance of carbohydrates, fats and proteins, with an adequate caloric content. And most important, it has to taste good! If you are just getting started with this curriculum area with your students, consider the gorp and granola preparation activities in the Elementary Wilderness Cooking lesson (p. 181) as potential beginning points.

The two activities suggested for middle school are a "lecture" (with samples) on nutrition as it applies to wilderness rations, and a cooking class, possibly over a campfire. If you choose to use a campfire, we recommend that you do the Leave No Trace lesson in this strand as well. Students need to know when it is acceptable to build campfires in the wilderness, and that most often it is preferable to use a stove. The nutrition lecture provides reasons why we try to take a variety of foods on wilderness trips. It can also compliment curriculum in health education.

Please refer to Richard, Orr, and Lindholm's ***The NOLS Cookery,*** *in the Wilderness Box. It summarizes some of the nutritional theory and all of the NOLS/Wilderness Education Association techniques for wilderness rations planning.*

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary-Skills), Page 185
- Wilderness Decision-Making and Group Dynamics—(Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Equipment Selection and Use—(Middle-Skills), Page 337

Activity 1: Nutrition and Wilderness Rations

Materials: Chalkboard or flip chart, chalk or markers

Examples of each of the following types of foods:
  Simple carbohydrate: Dried fruit, candy, or powdered fruit drink
  Complex carbohydrate: pasta, mashed potatoes, bread or pudding
  Fat: margarine, chocolate, cheese or nuts
  Protein: powdered milk, cheese, beans, rice, or grains
  (Several prepared dishes for samples are a nice touch)

NOLS Cookery

Procedure:

1) Ask students what they would need to consider if they were planning the food for a long wilderness trip. Write the considerations on the chalkboard. They should include something like the following: First, the length of a trip and its objectives are the foundation to build upon. (Foods for river trips can be slightly heavier; foods for summer trips must resist spoilage; foods for high elevation trips must be easier to cook, etc.) Next, foods must provide enough energy, and be nutritionally balanced. Caloric content must be considered in relation to both weight and bulk. Expense is always an important factor. Availability can become a problem as well. Ease of packaging and handling are issues, as are ease and length of preparation time. The longer the trip the more important food variety becomes. Also, the more variety, the better the chances of appealing to everyone's tastes. After a list like this has been generated, focus on the challenge of finding foods that meet these constraints. Create a second list that contains foods that the class agrees meet the tests. Review the Sample Ration on page 10 of NOLS Cookery beforehand, so that you can highlight the really good ideas.

2) Discuss with students the roles of carbohydrates, fats, and proteins summarized in the **Student/Teacher Information Sheet** at the end of this lesson. You may wish to duplicate it as a handout, or alternatively, go over the material verbally as a lecture. Show examples of each type of foods as you discuss them. Taste tests at the end are a good reward for good listeners!

3) You may also wish to discuss vitamins and minerals, salt use, and water. It is generally thought that essential vitamins and minerals are either adequately provided in wilderness rations, or the body has a sufficient reserve to provide for a wilderness trip of up to a month. Three essential nutrients perhaps worthy of mention are iron and vitamins C and E. Iron is normally obtained largely through green leafy vegetables and meat, items not prominent in wilderness rations. Raisins and dried apricots are also good sources of iron, however. Water-soluble vitamins C and E are typically obtained from fresh fruits and vegetables not normally included in wilderness rations. Regular doses of powdered fruit drinks supplemented with vitamin C are a convenient way to address this issue.

Salt depletion and replacement has been controversial over the years. Dr. William Forgey (1987), Wilderness Medical Society, recommends salt be used in cooking with typical NOLS/ Wilderness Education Association rations. They emphasize whole foods and cooking from scratch, protecting us from large and uncontrolled doses of salt often found in pre-packaged foods. The average wilderness hiker loses approximately six quarts of fluid a day through perspiration and evapo-transpiration. Fluid replacement should be an ongoing activity throughout the day. Plain water should be the primary replacement (Forgey, 1987), although fruit drink mixes may make drinking fluids more attractive. The level of fluid loss is not necessarily lower in winter, although it may be less noticeable. Dark yellow urine is the indicator of dehydration.

Evaluation:

Assign students the task of planning a balanced, healthy menu for a three day backpacking trip.

Activity 2: Stove Operation

Materials: Backpack stoves (one per three to five students is ideal, but the class can be done with even one stove)

Stove operating instructions

Fuel bottle with fuel

Matches and/or lighters

Stove storage container (or stuff sack)

Stove repair kit

Duration: 45 minutes

Location: Outdoor area, preferably with some wind protection

Procedure:

1. Ask students why knowledge and use of lightweight backpack stoves is an important wilderness skill. Stoves should be the primary means of cooking in wilderness. Fires should be used only when essential for baking or some other specialized activity, and only in areas with plentiful small, dead and down firewood. If there is any doubt about the impact a campfire might create, a stove should be used.

2. Discuss stove safety next. You might point out that using stoves is the second most dangerous activity on a wilderness trip (next to driving to the trailhead!) As long as a few safety precautions are observed, however, there should be no accidents. A level, stable location should be selected for the stove, protected from wind and well away from other sources of flames. Stoves should never be used in tents except as a last resort on extreme winter trips. If a stove should flare up out of control, turning the stove off is the first step, if it is possible. Then a billy can or something similar can be placed over it to smother the flames. Water should never be used to extinguish the flames, as the fuel will simply float on the water and continue burning.

3. The next step is filling the stove with fuel. This should be done at least 25 feet away from the cook site, and away from any other source of flames. Caps for the fuel bottle and stove fuel tank merit attention. Be careful not to lose the washer off the fuel bottle cap or cross-thread it when closing it. The cap for the stove fuel tank should be regarded as a precision tool. If it is damaged the stove becomes useless. Follow the manufacturer's directions on how much to fill the stove. Often it should only be filled about three quarters full to permit vaporization.

4. Demonstrate and explain starting the stove following the manufacturer's directions. Light the match before turning on the gas. Explain how the stoves you are using operate. Demonstrate the procedure for turning the stove off. Let the stove cool off before packing it. Release the gas pressure in the fuel tank and tighten the fuel tank

cap securely. Make sure the on/off valve is in the "off" position. Pack the stove upright in the backpack, usually in a stuff sack or other container, below and well away from food items to prevent contamination.

5. Divide the class into small groups, each with a stove and matches, and let each person practice lighting the stove with peer observation and feedback. Remind them to let the stove cool off in between each lighting.

Activity 3: Stove Cookery

Materials:

"Billy cans" (#10 steel cans)
Pot grips (plier-type grippers for hot pots)
Metal serving spoons
Cotton gloves
Fry pans or tote ovens
Pots
Spatula
Collapsible plastic water jug
Water bottle
Eating utensils and containers for each student
Fire rings, or area suitable for building a low-impact campfire

NOLS Cookery

Procedures:

1) A few safety precautions are really prerequisite for any kind of cooking class with kids. Make a list of the following items and post it or read it out loud before the activity begins.

1. A 3-5′ circular "safe" area should be created around the campfire or cooking area. Only the "cooks" are allowed in this area, and no one else should walk through, reach over or horseplay near the food operation. Select a cooking site at least 200 feet from lakeshores, streams, creeks, or rivers.
2. Stoves should be filled with fuel at least 25′ away from the cook area, and fuel bottles should be closed securely and removed from the area.
3. All serving and eating utensils should be sterilized before using by placing them in a boiling water bath in a billy can for at least one minute.
4. Use pot grips and cotton gloves when handling hot items. Remove hot pots from the fire before stirring or adding ingredients. Hot foods should not be poured across another person or into hand-held container.
5. A water-filled billy can should be kept nearby for safety when using a campfire and an empty billy can should be kept to smother a flare-up

over a stove.

6. Cooks must be particularly aware of potential dangers such as loose clothing or long hair.
7. Use a hard surface to cut bread, cheese, pepperoni, or other items, rather than a leg or hands.

2) There are many ways to organize a cook class. The basic model on National Outdoor Leadership School and Wilderness Education Association courses is a demonstration by instructors with taste tests. Pot luck meals are a wonderful second step, if you can acquire sufficient gear. If competition seems appropriate, consider giving prizes for the group that started with the lightest ingredients, or with the highest caloric value rather than the best tasting. Also, so many wilderness rations lend themselves to ethnic or international cooking, a bioregional pot luck is easy to do!

3) All utensils, pots and pans required for cooking a meal should be organized and laid out in an orderly fashion in the cooking area. Ensolite pads or jackets can be used as "tablecloths". Ingredients to be used in meal preparation should be removed from food bags and arranged on the tablecloth.

4) Try the recipes in **NOLS Cookery**. Start with the ones that seem manageable to you. Experimentation is the key word in wilderness cooking, so don't be afraid to try new ideas. Lasagna, Mexican casseroles, pizzas—all are possible over the campstove! Favorites for use in classes are Donna's Hash Brown Fritters and Hot Sweet Rice for breakfast, or Tabouli Salad, Pizza, Cheese Bombs, Fry Breads, and Miso Soups for dinner recipes.

5) There are some guidelines for novice cooks. To prevent burnt food: Cook on low heat; stir constantly; be sure there is sufficient water; and keep pots clean. Bland vs. spicy foods: Use salt sparingly; experiment with spices one at a time; taste foods before spicing. To prevent overdone foods: add dehydrated items first and let them hydrate; add pastas next; thickeners last. Remember high elevations: Water boils at a higher temperature than 212 degrees F., so cooking times are longer.

6) If you are conducting this activity in wilderness or any other natural setting first familiarize yourself with "Leave No Trace" techniques in Lesson Four (Page 191). Special care should be taken to avoid spilling or burying food scraps as they may attract wildlife. Don't let your carelessness cause the unnecessary death of wild animals. If you use a campfire, collect only downed and dead wood and remove all traces of your campfire before you leave!

Credits: Cockrell, D. (Ed.) *The Wilderness Educator.* (Merrillville, IN: ICS Books, 1991).
Lappe, F. M. *Diet for a Small Planet.* (New York: Ballantine Books, 1975).

Simer, P. and Sullivan, J. *National Outdoor Leadership School's Wilderness Guide.* (New York: Simon and Schuster, 1983).

Forgey, W. *Wilderness Medicine.* (Merrillville, IN: ICS Books, 1987).

Richard, S., Orr, D., and Lindholm, C. *The N.O.L.S. Cookery* (Harrisburg, PA: Stackpole Books, 1991).

Extensions:

- See the lessons on Introductory Cooking, Yeast Baking, Frying and Baking, Food Identification, and more in Jack Drury and Bruce Bonney's book The Backcountry Classroom, Merrillville, IN: ICS Books. Also the **Wilderness Ranger Cookbook**, U.S.D.A. Forest Service.
- If you can arrange to purchase or borrow a food dehydrator, you can greatly expand the rations available for wilderness cookery. Turkey or beef jerky can be nice additions to a diet based primarily on vegetable protein. Mushrooms, tomatoes, green peppers and other vegetables dehydrated as a class project will be vastly less expensive than those purchased commercially, and they can be used in more ways too. A comparison of fresh food weights and dried weights provides an opportunity for a math exercise.

Evaluation:

Small groups of students can plan and prepare a dish or meal for another small group, or the entire class. If the food is edible, students pass the test.

When the bird and the book disagree, always believe the bird.

—Birdwatcher's Proverb

NUTRITION AND WILDERNESS RATIONS

Perhaps the most important issue in wilderness rations planning is to provide enough energy to accomplish the goals of the trip. In general, daily energy needs for campers range from 2,800 to 4,000 calories in summer, and from 3,800 to 6,000 in winter. However, as the authors Simer and Sullivan (1983) pointed out, no one wants to get 3,500 calories by gagging down a one-pound block of butter and a half pound of cheese. Fortunately, the variety we want is often the variety we need.

Calories for energy are contained in three types of foods: Carbohydrates, fats and proteins. Carbohydrates are the simplest foods and the most easily accessible form of energy. Pure carbohydrates provide four calories per gram (Lappe, 1975). The simplest carbohydrates are sugars. They become accessible to the body within a few minutes of eating. These make good trail foods! Examples include dried fruits, sweetened fruits, sugar, syrup, candy, jam, honey and fruit drinks. More complex carbohydrates, such as starches, take longer to digest but are still relatively quick energy foods. You might want to eat these at breakfast. They include breads and cereals, potatoes, corn, pasta, pudding and cocoa. Because they are easy to prepare and provide quick energy, carbohydrates are the primary food in the wilderness. This is even more important above 7000′ in elevation because food is harder to digest up there, and water boils at a lower temperature, making cooking more difficult.

Fats are also important because they supply nine calories per gram—a much larger amount of energy in a smaller amount of food. Fats provide essential "fatty acids" which help your skin stay healthy. They also carry the fat-soluble vitamins A, D, E, and K. However, fats are more complex than carbohydrates, so they require from several hours to overnight to digest. When fats are included with dinner, the wilderness traveler gets lasting energy for sleeping warmly and getting going in the morning. Fats are found in margarine, cooking oil and shortening, cheese, nuts and fatty meats. About 25% of an outdoor diet should be fats, with a little more in winter.

Why couldn't a hiker get by on carbohydrates and fats alone? The answer is that only protein can help rebuild the tissues that are continuously being broken down in the body: Skin, nails, hair, cartilage and tendons, muscles and parts of the bones. Protein also makes up hormones, enzymes, and hemoglobin, the oxygen-carrying molecule of the blood. Blood proteins regulate pH level and water balance in the body, and new proteins are needed to fight infection.

Protein is important food! And protein reserves are drained from the body in only a few hours, so we need to eat it regularly. Proteins are made up of various combinations of 22 different amino acids. Eight of these can't be made within the body and must come from food. Unfortunately, the body must receive each of these eight essential amino acids in the same meal in order to make the new proteins. And finally, we need different amounts of each of the eight essential amino acids in order to make new protein, so the protein foods we eat have to have the right proportions of amino acids. Our bodies have lots of requirements about this!

The percentage of amino acids in a food that can actually be used as protein ranges from a low of about 40% to a high of 94%. At the top end of the range are eggs, milk, fish and cheese—

all foods that can be eaten on a wilderness trip, if you include powdered milk and eggs. Meats are actually in the middle of the range, even though meat is often described as a "complete" protein. However, fresh meats spoil so quickly that they really can't be used in wilderness rations in the summer. Sources of vegetable protein include seeds and nuts, legumes (beans), and grains. They have slightly lower usable protein percentages, but they travel better.

The key, then, is to try to combine protein foods so that an amino acid shortage in one is complemented by a strength in another. For example, white bread and cheese would provide an average usable protein percentage of about 64% if they were eaten separately, but a cheese sandwich has a usable protein percentage of 76%. Maybe there was method in the madness of the Earl of Sandwich! Some other successful combinations are beans and rice, peanuts and wheat flour, and macaroni and cheese.

Lesson 3: Wilderness Equipment Selection and Use

Objective:

- Students will identify the essential items of equipment for an overnight wilderness trip including tents, sleeping bags, backpacks, stoves and cook gear, and be able to evaluate the quality of specific examples.

Background:

Being able to evaluate and select appropriate equipment for use in the wilderness environment is an essential skill for wilderness travelers and a fun way for kids to begin to learn good judgment. In selecting almost any kind of gear, there are trade-offs that must be made. The equipment items addressed in this lesson were selected as common denominators for most trips, but the activity described here could be applied to many other types of equipment as well. If you are not familiar with this equipment invite an outdoor equipment salesperson, parent, member of an outdoor/hiking club, or college recreation student to help you with this lesson. Or, take a field trip to a backpacking store to achieve the objectives of the lesson.

See Also:

- Wilderness Skills—(Primary-Skills), Page 83
- Basic Map Skills—(Elementary-Skills), Page 177
- Wilderness Rations Planning—(Elementary-Skills), Page 181
- Wilderness Fabrics and Clothing—(Elementary-Skills), Page 185
- Wilderness Decision-Making and Group Dynamics—(Elementary-Skills), Page 199
- Keys to Understanding—(Middle-Ecology), Page 269
- Basic Map and Compass—(Middle-Skills), Page 303
- Wilderness Nutrition and Cooking—(Middle-Skills), Page 329

Activity 1: You Be the Judge

Materials:

Internal and external frame backpacks
Down and synthetic sleeping bags, with stuff sacks
Two different styles of tents
Two different styles of backpacking stoves

Procedure:

1) Establish four different "stations" in different areas of the classroom: packs, sleeping bags, tents, and stoves. Locate at least two different designs of equipment at each station. You might wish to pack the packs with some weight ahead of time, and pitch the tents.

2) Divide the class into four different groups, one assigned to each of the four stations. Ask each group to identify good and bad things about the two different styles of gear at their station. What would each item be especially good for? What would be its limitations? Which would you rather have for a high mountain wilderness trip? Why? You may need to prompt them to examine each item carefully, e.g. lie down in the tents, stuff the sleeping bags, try on the packs, etc.

3) **Internal vs. external frame packs:** There are advantages and disadvantages to each style! The "frame" of an internal frame pack usually consists of two flat malleable aluminum stays inserted into sewn sleeves in the packsack itself. External frames are rigid welded aluminum, magnesium alloy, or plastic frames with separate packsacks attached to them by clevis pins. Internal frame packs almost always provide a more sensitive mechanism for securing the pack's weight close to the body. By design, they flex and move as the hiker moves. These features provide a more natural balance, especially important for skiing, climbing, traversing talus slopes or other difficult terrain. They also can be fitted quite well to any size hiker.

A rigid external frame, on the other hand, can be an excellent crutch for huge punishing loads! The rigid frame seems to help stabilize the heavy load and can allow greater control in distributing it between shoulders and hips. External frame packs are easier to pack in a balanced way. They are also more convenient for strapping on tents, food sacks and sleeping bags. Finally, some hikers who perspire alot find they can ventilate better and stay cooler with an external frame pack.

4) **Down vs. synthetic sleeping bags:** There are advantages and disadvantages to each! The five popular insulators at the time of this writing are goose down, Polarguard, Hollofil, Quallofill, and Thinsulate Lite Loft. Down is light in weight, highly compressible, expensive, and worthless when wet. Some down bags now come with a Goretex shell, which reduces the problem of loft reduction from moisture, but further increases the expense. The synthetic insulators are comparatively heavy and bulky, relatively inexpensive, and reasonably warm and comfortable when wet.

5) **Tents: Two pole vs. four pole dome:** Other comparisons can be just as good.) Typical two pole domes use an arching "x" design to support the tent with just two flexible aluminum poles. They can be fairly tall in the center (maybe 52"), they are light weight (a little over 5 lbs.), and they are relatively inexpensive. They are also a nightmare in a big wind, and somewhat cramped for two people with gear in the tent. A comparable four pole dome has a "geodesic" design which is quite durable in the wind. It also has about 10 more square feet of floor space. But, it weighs more than three pounds more and costs three times as much.

6) **Butane stoves vs. white gas stoves:** Butane burning stoves are amazingly simple, convenient devices. No priming, pre-heating, or pumping. When operated according to instructions, they burn with a uniform, predictable blue flame. However, propane canisters are not recyclable. The used cans must be packed out. They lose pressure in cold weather and are expensive. White gas stoves are more expensive, sometimes unpredictable, and heavier. But the fuel is less expensive, and they work at low temperatures.

Extensions:

- A stove operation demonstration can be done in conjunction with this lesson. If you try to teach stove operation with middle school students, arrange for one adult supervisor for every four students, and conduct stove activities outdoors only.
- Other extensions here are tent pitching and packing. See Drury, J. K. and Bonney, B. ***The Backcountry Classroom*** (Merrillville, IN: ICS Books, 1992) for lesson plans on both of these topics.

Evaluation:

After the examination period, ask each group to do a presentation to the class, outlining the advantages and disadvantages of each item. Ask the class for feedback on the presentation and additional ideas. Cockrell, D. ***The Wilderness Educator.*** (Merrillville, IN: ICS Books, 1991).

Lesson 4: Leave No Trace

Objective:

Students will understand the six basic "Leave No Trace" principles of backcountry use, and be able to demonstrate specific techniques implementing the principles.

Background:

Over the past several years, the Federal Land Management Agencies have worked in collaboration with the National Outdoor Leadership School and other partners to develop a program to teach skills for protecting the backcountry environment, entitled "Leave No Trace." A variety of curriculum materials for varying audiences have been produced, including the following:

- **Leave No Trace: Outdoor Skills and Ethics Booklets** (applicable to your area)
- **Leave No Trace Poster**
- **Soft Paths,** Hampton, B. and Cole, D., 1995.
- **Soft Paths videos.** (15 and 31 min.)

One set of most of these is included in the Wilderness Box.

The curriculum content for this lesson is the Leave No Trace program. In preparation for this lesson, it is suggested that you familiarize yourself with the Leave No Trace practices presented in the brochures in the Box. At the elementary level we focused on the practices recommended on planning, travel, camping, fires etc. These practices form the foundation for the development of good judgment about no trace use and should be reemphasized at the middle school level. One good way to review the basic skills is to have students study the **Leave No Trace booklet.**

The six Leave No Trace principles are a kind of conceptual umbrella for applying no trace skills, and these can also be taught at the middle school level. They include:

- Plan ahead and prepare
- Camp and travel on durable surfaces
- Pack it in, pack it out
- Properly dispose of what you cannot pack out
- Leave what you find
- Minimize use and impact of fire

Activity 2, the skills trail activity is an opportunity to teach these principles in relation to no trace skills. Base your discussion at each skills trail station on the **Backcountry Skills Trail Facilitators Guide** found with the Skills Trails posters. A follow-up activity is to watch the 31 minute **Soft Paths** video and discuss it.

See Also:

- Wilderness Impacts—(Primary-Connections), Page 79
- Leave No Trace—(Elementary-Skills), Page 191

Activity 1: Leave No Trace: Test Your Skills

Materials: **Leave No Trace! booklet,** one for each student (These can be ordered free as of this writing from the National Outdoor Leadership School by calling, 1-800-332-4100, or you could reproduce them yourselves.)

Answer sheet is in the manila envelope.

Procedure: 1) Hand out the brochures and announce that there will be a test at the end of the session. We recommend that you permit the students to grade their own tests and not assign grades to their work. One of the most important ideas in the Leave No Trace program is developing the ethic of minimum impact use. Grading one's own test honestly helps work toward that goal. Go over each of the topics in the brochure, and discuss the recommended practices. Some students will probably need clarification for some concepts such as not shortcutting switchbacks on the trail. Others may generate considerable controversy, such as toilet paper disposal, or using stoves instead of campfires. Such controversy should be encouraged, and you can help students to become aware of how significant the problems of human impact on wildlands really are. Remember, an ethic, ecologically, is a "limitation on freedom of action in the struggle for existence" (Leopold, 1949). We may have to consider changing some very basic habits, if we care about the condition of our wildlands.

2) Have students take the test. Then go through the test and discuss each question. You might ask students to tell you which answers they think are correct, if there is a high enough trust level. Encourage discussion and try to work through confusion in a supportive way.

Activity 2: The Skills Trail

Background:

*The **"Backcountry Skills Trail"** was created in order to encourage an active learning process involving outdoor ethics and behavior. A hands-on approach to learning, with participation by the learner, is interesting and encourages better retention of the material. We challenge you to make the subject of wilderness and backcountry etiquette fun and enjoyable. Use your imagination, be creative and involve participants. Your help is needed to protect our priceless outdoors.*

The skills trail consists of a number of "stations," each of which addresses a particular backcountry concern expressed in the station heading. Illustrations are used to highlight, and often contrast, key elements of the station topic. Below each station's illustrations is a challenge to the participant in the form of questions or a scenario regarding the topic. Finding "right and wrong" answers is not as important as breeding discussion.

There are two versions to the skills trail. Version one is the most challenging of the two and requires "station items" (props). Version one works best when guided by a facilitator. Version two does not require station items and can be self guided. Worksheets and information for both versions are contained in this guide and may be photo copied as needed. Have fun!

Materials: **Skills Trail Posters** and Facilitators Guide
Pre-Travel: Destined to succeed
Pack a Pack: Sole food
Pack a Pack: Hard wear

Fires or Stoves: A hot topic

Camp: A site to behold

Sanitation: When nature calls

Au Natural: Composte naturalization

Wet & Wild: Is that H2O really safe?

Horse Travel: Good horse sense

Backpack packed with a few items of clothing, dried foods such as beans or instant mashed potatoes repackaged into plastic bags, and a bottle of biodegradable soap

Stove and fuel bottle

Small roll of toilet paper and a garden trowel

Lightweight backpacking tent

Procedure: Identify a reasonably large outdoor site ahead of time. There aren't too many requirements of the site, but if you can do the trail in some interesting terrain and really make it into a kind of hike, it adds to the activity. Establish the sites listed above and post the appropriate sign at each. Pitch the tent at the Campsite Selection site, and try to locate this on some resilient vegetation (e.g. grass), or at an established campsite. Locate the stove and fuel bottle at the Fires and Stoves site. If there is an old fire ring in the area, tbat is a good place for Fires and Stoves. At the Human Waste Disposal site, dig a cathole into organic soil and leave the toilet paper and trowel next to it.

Now you are ready for the hike. Ask one of the students to carry the backpack, and trade off periodically, so that several students have the opportunity to carry it.

1. **Pre-travel: Destined to succeed:**

   Station Theme: Experienced campers plan their trips.

   Resource Issues: Well-planned trips result in good decisions that help reduce resource damage.

   Station items: Topographic maps, compass, manual with hints for map reading, paper, pencil...

2. **Pack a Pack: Sole food:**

   Station Theme: Good meal planning helps reduce weight and trash.

   Resource Issues: Unsightly and unsanitary trash from poorly planned meals.

      Food scraps that contribute to the poor diet of wildlife

      Potential water pollution

      Over-loaded packs lead to fatigue and poor decision-making

   Station Items: Sole food list from guide book, food tubes, dry cereal, oatmeal, powdered milk, milk carton, honey, syrup, pancake mix, peanut butter and jelly, mayo jar, tuna can, tomato sauce, paste with dry sauce mix, canned stew, dried fruit, foil drinks, dry drinks, soup cans, dry soup, rice, bread sticks, crackers, cheese, weenies and beans, cups of cereal...

3. **Pack a Pack: Hard wear:**

Station Theme: Most of us carry too much gear into the backcountry.

Resource Issues: Carrying too much often leads to trash being left behind.

Heavy packs cause campers to reach destinations late and make poor campsite choices.

Some equipment, like saws and hatchets, inevitably result in damage to vegetation.

Station Items: Hardware list from guide book, hatchet, backpack saw, food tubes, collapsible jug, water pump, tent, stove, sleeping bags, pillow, blanket, tarp, cook kit, one pot and pan, utensils, small jackknife, cups, bowls, plates, trowel, clothing, radio, garbage bag, toiletry...use imagination!

4. **Fires or Stoves: A hot topic:**

Station Theme: Deciding how to cook your meals may prevent or cause damage to the land.

Resource Issues: Fires can kill vegetation and sterilize soil.

Fires can leave unsightly scars and contribute to the expansion of bare ground.

Branches and trees used for firewood provide wildlife habitat and also decay into topsoil. Breaking branches from trees also strips an area of its unspoiled character.

Station Items: Backpack stove, fuel bottle, branches of the proper size, perhaps even an entire fire circle showing the wrong way to build a fire with charred rocks and trash in the pit.

5. **Camp: A site to behold:**

Station Theme: Choosing a campsite that will minimize your impact is one of the most important decisions you will make.

Resource Issues: Campsite selection impacts vegetation, wildlife and the solitude of other visitors.

Station items: Several photographs of campsites in different conditions, paper and pencil.

6. **Sanitation: When nature calls:**

Station Theme: Disposal of solid human waste demands careful decision making.

Resource Issues: Fecal waste can spread disease, pollute water, and is unsightly.

Station Items: Toilet paper and trowel, pencils and paper for ideas...

7. **Au Naturel: Campsite Naturalization:**

   Station Theme: Breaking camp requires more than simply picking up your litter.

   Resource Issues: Encouraging people to choose heavily used sites confines impacts to small areas.

   > Camouflaging sites that should not be used again prevents campsite proliferation.
   >
   > Proliferation of campsites leads to loss of vegetation, erosion and greater impacts on wildlife and other visitors.

   Station items: Photographs of campsites in different conditions or, for variety, set up actual campsites with rocks, ash and litter (for a fire circle); duff and pine needles (for rehabilitation).

8. **Wet & Wild: Is that H20 really safe?:**

   Station Theme: Wild water should not be considered fit to drink until it has been properly treated.

   Resource Issues: Open water can carry disease.

   Station items: Iodine tablets, stove, water purification filter...

9. **Horse Travel: Good horse sense:**

   Station Theme: Packing with animals requires good horse sense.

   Resource Issues: Repeated trampling by stock can destroy vegetation.

   > Pack animals permit equipment to be brought into the backcountry which can lead to high impact camping practices.

   Station items: Webbing for tree savers, hitch line (high-line), hobbles, picket, equipment (Dutch oven, extra line, heavy gear, light gear, etc.), photographs of horse damage, easy boot.

Credits: Wasache-Cache National Forest -Backcountry Skills Posters and Facilitators Guide

Leave No Trace booklets, LNT, Inc.

For more in-depth treatment of selected topics, see:

Cockrell, D., ***The Wilderness Educator*** (Merrillville, IN: I.C.S. Books, 1991).

Forgey, W., ***Wilderness Medicine*** (Merrillville, IN: I.C.S. Books, 1987).

Evaluation:

Make arrangements with elementary class, for middle school students to become the teachers of the Skills Trail.

Activity 3: Soft Paths (The Video)

Materials: **Soft Paths video** (31 minute version)

Procedure: 1) We recommend that you show the video after the Skills Trail. If students have a chance to get out and see some of the practices in action, the depiction of an actual trip in the video will have more meaning for them. Discussion questions might include the following: Would you like to be on a trip like the one in the video? Are all of these leave-no-trace practices really necessary? Are any of the practices too much trouble to be worth it? How would you feel about not having a campfire on a wilderness trip? Have you ever been to a park or natural area that showed alot of impact? How did that make you feel? What could you do to restore or rehabilitate the impacts?

Extensions:

If your students have not already seen the Impact Monster Skit, consider that as a follow-up to the Skills Trail. The skit is described in the Elementary Skills Strand. Another good follow-up is to take an Impacts Hike. Identify a park or natural area nearby that receives considerable use, preferably including camping. Take students on a hike through the area. Look for a project that can be done to minimize evidence of human use, such as clearing up a firering or picking up litter.

Evaluation:

- Use Leave No Trace test as a post test. Compare post-test scores with test given in Activity 1.
- Students can write, perform, and videotape a skit for younger students including "Leave No Trace" camping techniques.

Lesson 5: Wilderness Decision-Making

Objective:

- Students will describe the steps in wilderness decision-making process, and apply them to a hypothetical problem in travel.

Background:

Every time a decision must be made in the wilderness environment, the situation is different. Some wilderness decisions are fairly straight forward; others are plagued with uncertainties and risks. When knowledge is incomplete, analysis of situations includes judgment. Judgment involves abstracting ideas or principles from prior experiences and applying them to current situations which have similar characteristics. Using judgment in decision making involves framing the problem, analyzing relevant concerns, identifying and weighing options, making and implementing a decision, and evaluating its success. The activity included here is a concrete wilderness problem that could be encountered by any group of hikers and encourages students to use good judgment to deal with uncertainty.

See Also:

- Wilderness Management—(Middle-Connections), Page 297

Activity 1: Decision At High Mountain

Materials: Student/Teacher Information Sheet

Procedure:

1) Divide students into groups of four or five. Make sure each group has a copy of the Student/Teacher Information Sheet at the end of this lesson. Allow a few minutes for everyone to read and study the situation silently. Then ask groups to discuss the situation and think about what might be done.

2) After 5-10 minutes of discussion, interrupt the groups. Announce that in 15 minutes they will be responsible for giving a group report to the class that addresses each of the following questions: What are the problems that the hiking group faces? What are the issues that make the problems real? What are the solution options among which they could choose? Which option would your group choose? How would you know how good an option this actually was? Write these questions on the chalkboard to help students remember them.

3) When the time comes, ask the groups to come together and listen to each others' reports. Provide enough structure to encourage each group to address each point in sequence. Encourage audience questions, but restrain them from becoming too judgmental. Remember, there is no one right way out of this!

4) Summarize by discussing good judgment in Wilderness. Ask what experiences students have had that influenced their thinking as they tried to answer the questions. How did they apply their previous experiences to this particular situation? How sure were they that their ideas would get them out of the predicament? Was the process that they went through similar to what it would really be like in Wilderness? Why or why not?

Evaluation:

Ask students to write an ending to the story, explaining what they did. The story may or may not have a happy ending!

No beast has ever conquered the earth; and the natural world has never been conquered by muscular force.

—Liberty Hyde Baily

DECISION AT HIGH MOUNTAIN

Early on the morning of November 29th, Bob, Sue, and Mark headed into the High Mountain Wilderness on their third backpacking trip together. The weather was crisp and cool, with daytime highs in the 30's and the thermometer dipping into the teens at night. There were two inches of snow on the ground with a possibility of additional snowfall over the weekend.

Bob, who was 16, and Sue, 17, were well dressed for the outing in wool pants and shirts, and rubberized, insulated, winter hiking boots. Both were well equipped with good quality synthetic insulated sleeping bags and sleeping pads. Mark, who was 14, was not so well prepared. He had only been backpacking on two previous occasions and was not yet ready to spend the money necessary for the proper gear. So when they met Saturday morning, Mark appeared decked in blue jeans, cotton thermal longjohns, a hooded cotton sweatshirt, cotton tube socks, and leather workboots. He carried his gear in a too-small, borrowed backpack, and intended to sleep in a goosedown sleeping bag on an air mattress. The group would all sleep together in Sue's three-person mountain tent.

Although the three had to be back at school early Monday, it was the last thing on their minds as they sped along the interstate highway on their four hour drive. Bob casually mentioned that he forgot to tell his parents exactly where they were going, and Sue admitted she forgot too. Mark had told his parents they were going backpacking in the mountains and that they would be back by 11:00 P.M. Sunday.

The group hiked up the Lake Clear trail that Saturday afternoon with the intention of staying overnight at the lake and returning to their car the next day. Although the trail to the lake was over four miles long, the terrain was pretty easy, and the three friends reached their destination by early afternoon. After setting up camp and eating dinner, the three settled into their tent for a well-deserved rest. Bob noticed that his flashlight beam was getting a little dim, and he had the only flashlight. As the night sky darkened and the thermometer dipped, a gentle snow began to fall.

Bob was the first to awaken on Sunday morning to a trackless, white world covered by the accumulation of the night's snowfall. Emerging from their cocoons at about 8:30 A.M., the campers set to the task of preparing a hot breakfast. After a breakfast of oatmeal and hot chocolate, the three stayed in their sleeping bags enjoying the warmth and friendly conversation. Around noon they had a little lunch and packed up. Mark remarked how wet his sleeping bag still was from condensation inside the tent, and said he was glad he didn't have to crawl back into it tonight. His jeans were frozen too, since they had gotten wet from playing in the snow.

By 1:30 P.M., all three were ready to head back on the trail home. Talking excitedly about the beauty of the new fallen snow, and without paying any great attention to trail markers on the trees, they moved out in what they thought was the direction they came from. After 30 minutes on the trail, Bob remarked how different everything looked from the day before. He hadn't even noticed that trail shelter over there yesterday. Sue mentioned that they should watch out for trail markers since their footprints from yesterday were covered with new snow now. Within another 15 minutes, it was obvious to all that they were not sure where they were.

Since Bob had the only map and compass, he tried to figure out where they were. Quickly, it became clear that he just didn't have the skill to figure it out. Reasoning that the trail had to be close by, they decided to spread out and look for markers. Within a few minutes, they discovered a marker and headed down the trail somewhat relieved. They continued to hike for another 45 minutes when Bob called out that he could see a trail sign in the distance. Hustling over to the sign, they read in astonishment:

"Trailhead via High Pass Trail 3.6 miles"

"Trailhead via Lake Clear Trail 7 miles"

"Lake Clear Lean-to 2.9 miles"

Their hearts sank as they realized they had been walking in the wrong direction all afternoon. Now, at 3:30, with darkness only an hour away, they faced a decision. High Pass Trail was a direct route to the car but a quick glance at the map showed that it involved a 1500 ft. gain in elevation to a saddle well above timberline. Returning to the trailhead by the route they had just traveled would take them past Lake Clear lean-to on a familiar trail, but would mean nearly 3.5 more miles of trail.

What should they do?

FURTHER READINGS & REFERENCES

A BIBLIOGRAPHY OF WILDERNESS RELATED BOOKS, ARTICLES AND REFERENCES

For Wilderness Education

TOPIC AREAS:

Picture Books for Young Readers & Listeners
Juvenile/Young Adult Literature
Notable Authors for Any Age
Videos & Recordings
Natural History
History
Education and Interpretation
Ecological Philosophy
Wilderness and Land Ethics
Natural Resource Management / Policy
Wilderness Management, Selected Technical References
Restoration
Wilderness Tools and Techniques
Environmental Literature and General Interest
Young Adult Books

FURTHER READINGS & REFERENCES

Picture Books For Young Readers & Listeners

Chipmunk Song by Lynn Cherry

Wilderness Cat by Natilie Kinsey-Warwock

Brother Eagle, Sister Sky by Susan Jeffers

Frolics Dream & Delver's Danger by Susan Thompson Hoffman & Valerie Harms

Deep Down Underground by Oliver Dunrea. Good counting book

Red Squirrel by Hope Ryden

The Sense of Wonder by Rachael Carson

Look Again (A spot the difference book) by April Wilson

Crow & Weasel by Barry Lopez

Take a Hike Sierra Club Guide for Kids by Lynne Foster

Nature's Tricksters by Mary Batten

Do Not Disturb by Margery Facklam

Random House Book of 1001 Questions & Answers by Michele Staple & Linda Gardia

Willy Whitefeather's Outdoor Survival Handbook for Kids by Willy Whitefeather

Crinkleroot's Guide to Walking in Wild Places by Jim Arnosky

Voices of the Wild by Jonathan Jodon

Juvenile/Young Adult Literature

Beaver on the Sawtooth by Bernice Freschet Young. Beavers are transplanted by forest rangers into a remote wilderness.

Martha Maxwell: Pioneer Naturalist Florence Sabin: Pioneer Scientist by Sybil Downing & Barker, Pruett Press

Mapmakers of America by Carl Hirsch. Describes the experiences and methods of 8 expeditions undertaken to chart the American wildlands from Coronado's search for Cibola in 1540 to John Wesley Powell's journey down the Colorado River in 1869

In Search of a Sandhill Crane by Keith Robertson. Dismayed at the prospect of a summer in the Michigan wilderness, a young boy becomes increasingly fascinated by nature as he roams the woods in hopes of photographing sandhill cranes.

Jim Bridger's Alarm Clock & Other Tall Tales by Sid Fleischman, Three tall tales about Jim Bridger and several of his unbelievable discoveries in the wildlands of the West.

Wilderness Journey by Ruth Moore. Two Scotch-Irish boys travel across Pennsylvania in 1799 with a circuit-riding preacher to search for their mother.

READINGS & REFERENCES

A Different Kind of Gold by Cecily Stern. A young girl in Alaska helps her family save the land from developers.

Which Way to the Nearest Wilderness? by Tricia Springstubb. As she watches her parents' marriage deteriorate, 11 yr. old Eunice, the sensible child in the family, wants only to escape. c 1984

The Everlasting Hills by Irene Hunt. When a bitter mountain man cannot accept his 12 yr. old son's mental retardation, the boy wanders into the wilderness and finds in a stranger the father he has never had.

The Roadside by David Bellamy. Describes how the construction of a 6-lane highway in a wild area disrupts the balance of nature and forces the animals there to struggle for existence. c 1988

Incredible Journey by Sheila Burnford. Two dogs and a cat befriend each other and fight their way home across 200 miles of Canadian wilderness.

Log Cabin in the Woods by Joanne Henry. Recounts 11 yr. old Oliver Johnson's experiences living in the densely forested wilderness of 19th century central Indiana.

Wrong Way Ragsdale by Charles Hammer. In a moment of anger, 13 yr. old Emmett and his little sister Essie take off in their father's Taylorcraft airplane, make a forced landing in the mountains, and try to survive in the wilderness. c 1987

The Foxman by Gary Paulsen. A town boy sent to live on a remote farm forms a friendship with an elderly, disfigured man who teaches him many things. c 1977

Hatchet by Gary Paulsen. After a plane crash, 13 yr. old Brian spends 45 days in the wilderness, learning to survive, at first with only the aid of a hatchet given by his mother.

The Cookcamp by Gary Paulsen. During WW II, a boy is sent to live with his grandma, a cook in a camp for workers building a road through the Canadian wilds.

Downriver by Will Hobbs. Jessie and the other rebellious teenage members of a wilderness survival school abandon their adult leader, hijack his boats, and try to run the dangerous white water at the bottom of the Grand Canyon.

Weasel by Cynthia Defelice. Alone in the frontier wilderness in the winter of 1839 while his father is recovering from an injury, 11 year old Nathan runs afoul of the renegade killer known as Weasel and makes a surprising discover about the concept of revenge. c 1990

Get Out of My Face by David Masterton. 15 year old Kate finds her adjustment to her new 12 yr. old stepbrother, who is obnoxious and antagonistic, made ever more difficult when they have to help each other survive on a dangerous wilderness journey. c 1991

North American Indian Survival Skills by Karen Liptak

The Spark in the Stone: Skills & Projects from NA Tradition by Peter Goodchild

Videos & Recordings

Videos

Song Dog

Rocky Mountain Beaver (Nat. Geo.)

Catch Me if You Can (Landis Trailwood Films 1421 Huron S.D. 57350)

Tapes

Nature Nuts & Earthy Tunes

Raffi Ever Green/Ever Blue, MCA

Wolves & Humans: Wolf Vocalizations, Science Museum of Minnesota

Piggy Back Planet by Sally Rogers

Earth Tunes: Ancient Forests, Journey in Natural Sounds

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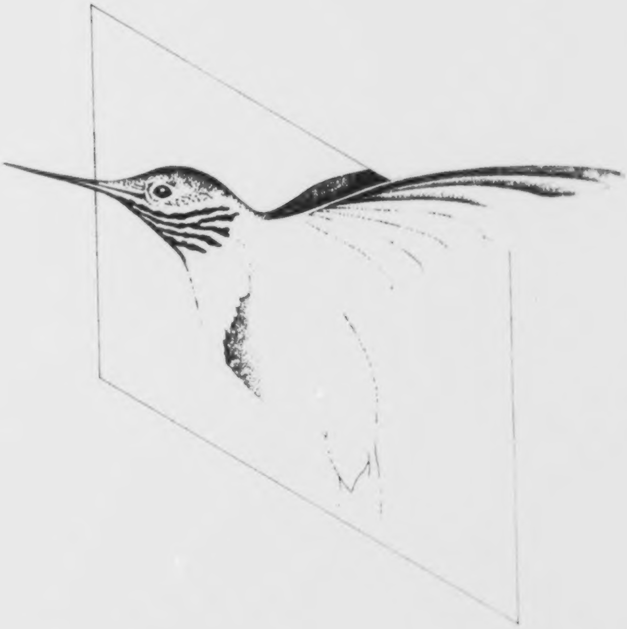

GLOSSARY OF TERMS

GLOSSARY OF TERMS

abiotic - A non-living factor in an ecosystem (e.g. air, sunlight, water).

acclimation - Alteration of physiological rate or other capacity to perform a function through long-term exposure to certain conditions.

acclimatization - Changes or differences in physiological state that appear after exposure to different natural environments.

acid rain - Precipitation with an extremely low PH. It is brought about by a combination of water vapor in the atmosphere with hydrogen sulfide and nitrous oxide vapors released to the atmosphere from the burning of fossil fuels. The result is a sulfuric and nitric acid in rain, fog and snow.

adaptation - Genetically determined characteristic (behavioral, morphological, physiological) that improves an organism's ability to survive and successfully reproduce under prevailing environmental conditions.

ancient forest - The late successional stages of forest development. Synonymous with old-growth forest. Characterized by large trees, a broken, uneven canopy, numerous snags, fallen logs, high biomass.

anthropocentrism - A view of life and the world that places humans above all other species in value and importance.

association - Natural unit of vegetation characterized by a relatively uniform species composition and often dominated by a particular species.

biodiversity - The range of different species - microbial, insect, plant and animal - which exist in any given area. Areas of high biodiversity contain many different genetic species. Areas of highest biodeversity typically occur in tropical forests.

biological diversity - The diversity of living things (species) and of life patterns and processes ecosystem structures and functions). Includes genetic diversity, species and population diversity, ecosystem diversity, landscape and regional diversity, and biosphere diversity.

biomass - Weight of living material, usually expressed as dry weight per unit of area.

biome - Major regional ecological community of plants and animals; usually corresponds to plant ecologist' and European ecologists classification of plant formations and classification of life zones.

biosphere - Thin layer about Earth in which all living organisms exist.

biotic community - Contains all living organisms within our ecosystem.

bog - Wetland ecosystem characterized by an accumulation of peat, acid conditions, and dominance of sphagnum mosses.

boreal forest - Needle-shaped evergreen or coniferous forest bordering subpolar regions; also called taiga.

bottleneck - An evolutionary term for any stressful situation that greatly reduces a population.

browse - Part of current leaf and twig growth of shrubs, woody vines, and trees available for animal consumption.

GLOSSARY OF TERMS

carnivore - Organism that feeds on animal tissue; taxonomically, a member of the order Carnivorea (Mammalia).

carrying capacity - Number of individual organisms that the resources of a given area can support, usually through the most unfavorable period of the year.

clearcutting - A logging method by which an entire forest stand is cut down. In national forests, the size of an individual clearcut cannot exceed 40 acres.

climax - State and community of succession that is capable of self-perpetuation under prevailing environmental conditions.

coevolution - Joint evolution of two or more noninterbreeding species that have a close ecological relationship; through reciprocal selective pressures the evolution of one species in the relationship is partially dependent on the evolution of the other.

coexistence - Two or more species' living together in the same habitat, usually with some form of competitive interaction.

community - Group of interacting plants and animals inhabiting a given area.

competition - Any interaction that is mutually detrimental to both participants; occurs between species that share limited resources.

commons - Large areas of joint-use land with social control resting in the hands of local communities and standards of use built on intimate knowledge of plants, animals, and ecosystems. Most commons were destroyed with the advent of industrial civilization, but some still exist in less developed parts of the world.

conservation - As originally coined by Gifford Pinchot, the development of natural resources for "the greatest good for the greatest number [of humans] over the longest period of time." Aldo Leopold defined conservation as "a state of harmony between people and land."

conservation biology - The field of biology that studies the dynamics of diversity, scarcity, and extinction.

continuum - Gradient of environmental characteristics or changes in community composition.

deciduous - (of leaves) Shed during a certain season (winter in temperate regions; dry seasons in the tropics); (of trees) having deciduous parts.

decomposer - Organism that obtains energy from the breakdown of dead organic matter to more simple substances; most precisely refers to bacteria and fungi.

deme - Local populations or interbreeding group within a larger population.

detritus - Fresh to partly decomposed plant and animal matter.

disturbance - In ecosystems, an event that interrupts succession, eliminates some part of the existing plant and animal community, and creates conditions for renewed growth and colonization. Examples are wildfire, windstorm, flooding, insect outbreaks, etc.

diversity - Abundance in number of species in a given location.

dominance - (Ecological) Control within a community over environmental conditions influencing associated species by one or several species, plant or animal, enforced by number, density, or growth form; (social) behavioral, hierarchical order in a population that gives high-ranking individuals priority of access to essential requirements; (genetic) ability of an allele to mask the expression of an alternative form of the same gene in a heterozygous condition.

dominant - Population possessing ecological dominance in a given community and thereby governing type and abundance of other species in the community.

dormant - State of cessation of growth and suspended biological activity during which life is maintained.

ecological efficiency - Percentage of biomass produced by one trophic level that is incorporated into biomass of the next highest trophic level.

ecosystem - A community of species and its physical environment. When defined at different levels, it often involves arbitrary boundaries. An ecosystem may refer to anything from a fallen log to an entire watershed.

ecosystem management - Any land-management system that seeks to protect viable populations of all native species, perpetuate natural-disturbance regimes on the regional scale, adopt a planning time line of centuries, and allow human use at levels that do not result in long-term degradation.

ecotone - Transitional zone between two structurally different communities; often termed "edge".

ecotype - Subspecies or race adapted to a particular set of environmental conditions.

edge - Place where two or more vegetation types meet.

edge effect - Response of organisms, animals, in particular, to environmental conditions created by the edge.

endangered - A legal classification of the federal Endangered Species Act under which a species is at risk of becoming extinct throughout all or a significant portion of its range.

endemic - Restricted to a given region.

energy - The capacity to do work.

entropy - Transformation of matter and energy to a more random, more disorganized state.

environment - Total surroundings of an organism, including other plants and animals and embracing those of its own kind.

eutrophic - Term applied to a body of water with high nutrient content and high productivity.

eutrophication - Sum of the loss of moisture by evaporation from land and water surfaces and by transpiration from plants.

evolution - Change in gene frequency through time resulting from natural selection and producing cumulative changes in characteristics of a population.

food chain - Movement of energy and nutrients from one feeding group of organisms to another in a series that begins with plants and ends with carnivores, detrital feeders, and decomposers.

food web - Interlocking pattern formed by a series of interconnecting food chains.

forb - Herbaceous plant other than grass, sedge, or rush.

forest plan - The comprehensive land-management plan required of each national forest under the National Forest Management Act.

gap analysis - A method of identifying important areas of biodiversity that remain unprotected.

gene - Unit material of inheritance; more specifically, a small unit of DNA molecule coded for a specific protein to produce one of the many attributes of a species.

global warming - The warming of the Earth resulting from the greenhouse effect.

greenhouse effect - Selective energy absorption by carbon dioxide in the atmosphere that allows short wavelength energy to pass through but absorbs longer wavelengths and reflects heat back to Earth.

habitat - An area that has the minimum required arrangement of food, water, shelter, and space for a particular species.

habitat fragmentation - Destruction of habitat through loss of functional habitat and the isolation of the remaining patches within an ecosystem.

herbivore - Organism that feeds on plant tissue.

hibernation - Winter dormancy in animals characterized by a great decrease in metabolism.

immigration - Arrival of new individuals into a habitat or population.

keystone species - A species that plays a role in an ecosystem that far outweighs the role of other species.

Krumbholz - Stunted form of trees characteristic of transition zone between alpine tundra and subalpine coniferous forest.

life zone - Major area of plant and animal life equivalent to a biome; transcontinental region or belt characterized by particular plants and animals and distinguished by temperature differences; applies best to mountainous regions where temperature changes accompany changes in altitude.

marsh - Wetland dominated by grassy vegetation such as cattails and sedges.

mesic - Moderately moist habitat.

microclimate - Climate on a very local scale that differs from the general climate of the area; influences the presence and distribution of organisms.

migration - Intentional, directional usually seasonal movement of animals between two regions or habitats; involves departure and return of the same individual; a round-trip movement.

mutualism - Relationship between two species in which both benefit.

natural selection - Differential reproduction and survival of individuals that result in elimination of maladaptive traits from a population.

niche - Functional role of a species in the community, including activities and relationships.

omnivore - Animal that feeds on both plant and animal matter.

opportunistic species - Organisms able to exploit temporary habitats or conditions

parasite - An organism living in or on another organism (the host) from which it obtains its nutrients. Parasites usually harm their hosts to some degree.

peat - Unconsolidated material consisting of undecomposed and only slightly decomposed organic matter under conditions of excessive moisture.

perturbation - Another word for disturbance; borrowed from physics to suggest an event that alters the state of or direction of change in a system.

photosynthesis - Synthesis of carbohydrates from carbon dioxide and water by chlorophyll using light as energy and releasing oxygen as a by-product.

predation - Act of one living organism consuming another living organism.

primary succession - Vegetation development starting from a new site never before colonized by life.

production - Amount of energy formed by an individual, population, or community per unit of time.

resource - Environmental component utilized by a living organism.

richness - Component of species diversity; the number of species present in an area.

riparian - Along banks of rivers and streams; river bank forests are often called gallery forests.

seral - Series of stages that follow one another in succession.

species diversity - The variety of species inhabiting an area.

stability - Ability of a system to resist change or to recover rapidly after a disturbance; absence of fluctuations in a population.

stand - Unit of vegetation that is essentially homogenous in all layers and differs from adjacent types qualitatively and quantitatively.

stochastic - Patterns arising from random factors.

succession - Replacement of one community by another; often progresses to a stable terminal community called the climax.

sustainable - Describes levels of human use that allow ecosystems to retain their basic structure and function over the long term.

symbiosis - Living together of two or more species.

territory - Area defined by an animal; varies among animals according to social behavior, social organization, and resource requirements of different species.

threatened - Legal classification under the Endangered Species Act that describes a species as likely to become endangered in the foreseeable future.

transpiration - Loss of water vapor by land plants.

tundra - Areas in arctic and alpine (high mountain) regions characterized by bare ground, absence of trees, and growth of mosses, lichens, sedges, forbs, and low shrubs.

viable population - A population that stands an excellent chance of surviving with minimal human management.

watershed - Entire region drained by a waterway that empties into a lake or reservoir; total area above a given point on a stream that contributes water to the flow at that point; the topographic dividing line from which surface streams flow in two different directions.

wilderness - Refers to any wildlands other than Congressionally designated Wilderness.

Wilderness - Only refers to Congressionally designated Wilderness - those areas set aside in the National Wilderness Preservation System for the use and enjoyment of the American people as wilderness. In these areas development and human presence are kept to a minimum and natural processes prevail.

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APPENDICES

WILDERNESS BOX MATERIALS

Books

____ Wilderness America: 25 Yrs
____ My Side of the Mountain
____ NOLS Wilderness Cookery
____ Signs Along the River
____ Sharing Nature With Children
____ The Lorax
____ Lost Lake
____ Wilderness Visionaries
____ The First 75 Years (NPS)
____ Public Lands, Public Heritage: The National Forest Idea
____ Centennial Mini Histories of the Forest Service
____ Words for the Wild
____ A River Ran Wild
____ Living Treasure
____ The Last Bit Bear
____ The Book of Fire
____ Audubon Bird Pocket Guide
____ The Other Way to Listen
____ 1 book in State Heritage Series
____ Zoobooks (2)
____ Quote Book
____ National Geograhic Handbook
____ Sand County Almanac

Maps & Posters

____ Wilderness Wolf Poster
____ Nat. Wild Preservation System
____ 30th Anniversary Poster
____ Agency Maps
____ Leave No Trace Poster
____ Fire Poster
____ State Wilderness Map
____ State Map
____ Outdoor Skills Posters (9)
____ Water Cycle Poster

Skulls & Pelts

____ Beaver Skull
____ Bobcat/Lynx Skull
____ Coyote Skull
____ Pelt

Videos, Tapes & Miscellaneous

____ Leave No Trace/Soft Paths-Video
____ A Kid for the Wild-Tape
____ The Green Scene-Video
____ Wildlife Postcards (12)
____ Compass (6)
____ Wild by Law Video
____ National/State Wilderness Slides (65)
____ Animal Slides
____ Wild Bag
____ Wolf Transparency
____ The Last Parable Video
____ A Kid for the Wild-Song Sheet
____ Five Puppets
____ Flannel Board - pieces
____ Contour Plastic Mountain Kit
____ Rock Collections and Box
____ Oh Wilderness Card Game
____ Battle for Wilderness Video

Curricula & Pamphlets

____ The Green Scene Curriculum
____ Leave No Trace, Skills & Ethics (set)
____ Wilderness Box Curriculum
____ Leave No Trace Educational Materials Catalog
____ Woodsy Owl EE Kit
____ Wild. Mgmt. Philosophy in RM
____ Women in Natural Resources 1990

APPENDIX A

WILDERNESS BOX MATERIALS

BOOKS

Wilderness America: 25 Years by Wilderness Society. Silver Anniversary edition turned into a book. Regional photos and articles of history and challenges addressing these areas of the country. Reference book for teachers and older students. ($11.00)

Words for the Wild The Sierra Club Trailside Reader. Collection of wilderness writings from Emerson to Barry Lopez. Good literary reference of some of the classic works. Might entice readers to investigate these authors more thoroughly. ($12.00)

My Side of the Mountain by Jean Craighead George. Classic story of young boy who escapes family troubles by living in the wilderness. One of the best of several books that deal with adolescents and wild places. Gary Paulsen and Kenneth Thomasma are also excellent authors about modern and American Indian kids. Good chapter book for teachers to read aloud. ($5.00)

A River Ran Wild by Lynne Cherry. An environmental history of the Nashua River. Story of historical use, pollution, and cleanup. Hope she writes more books along these lines! Picture book for primary and elementary. ($14.95)

NOLS Wilderness Cookery by NOLS. Good food, good ideas, good nutrition. Bon Appetit! ($7.00)

Living Treaure Saving Earth's Threatened Biodiversity by Laurence Pringle. Discussion of a theoretical topic in 60 pages at upper elementary level by an excellent scientist. ($13.95)

Signs Along the River by Kayo Robertson. Book for primary kids about reading tracks, signs, and other evidences in natural surroundings. End of book has informative key to illustrations. ($16.00)

The Last Bit Bear by Sandra Robinson. A cute book with a sad ending. An allegory for habitat destruction and endangered species. Think it best used with 3rd grade and up for greatest understanding, though younger kids may enjoy the story line. ($4.95)

Sharing Nature with Children by Joseph Cornell. A classic environmental education/sensory awareness activity book. Good for all ages, though generally younger kids. Basic activities you have probably seen before. ($8.00)

The Book of Fire by William Cottrell. Explanation of how fire works and fire ecology in big print with lots of illustrations. Reference book for older kids and their teachers. ($6.95)

The Lorax by Dr. Seuss. Story that will be understood at different levels from preschool to adult. Lots of symbolism that warrants good discussion at any age. ($12.00)

Lost Lake by Allen Say. New picture book about a father and son and a wilderness hike. Lots to say in a simple story about loving a place and loving each other. ($6.00)

The Other Way to Listen by Byrd Baylor. Unique style of this author with intriguing pictures is just one of many books she has written that express the intangible values of wild places. ($18.00)

Audubon Society Pocket Guide to Birds of North America by Audubon Society. Photos and descriptions of common western birds. ($8.00)

Wilderness Ways by Lenore Anderson and Brian Litz of Colorado Outward Bound. Easy writing and reading style with specific information about minimum impact backcountry skills. ($7.00)

APPENDIX A

Zoobooks, Bear book and Eagle book by Ranger Rick. A series of books that are good resource booklets for wildlife information, illustrations, and photos. Attractive format for kids. ($ 5.50 for both, $2.75 each)

Sand County Almanac by Aldo Leopold. A book of discovery that is fashioned for naturalists and artists and whose conclusion is a far-seeing challenge to all of us. ($10.00)

Public Land, Public Heritage: The National Forest Idea by Alfred Runte. An overview of Public lands and establishment of the United States Forest Service. ($16.95)

The First 75 Years by the National Park Service. This book covers the history and the prominent people in the National Park Service.($5.95)

Wilderness Visionaries by Jim Vickery. A book that focuses on prominent wilderness figures. ($9.95) Appropriate for grades six and up.

Centennial Mini-Histories of the Forest Service by the USDA-USFS. A collection of essays on the origins and evolution of the conservation movement and the National Forest System beginning in 1987.

POSTERS

Wilderness Wolf Poster by USFS/BLM. Collage of wilderness components in outline of wolf. Good starter for any program. ($2.00)

Fire's Role in Nature Poster by USFS. Good illustration of what happens in fire cycle. (Free)

Leave No Trace Poster. Good illustrations of Leave No Trace principles.

30th Anniversary Wolf Poster by USFS and San Juan Interpretive Association. Beautiful poster celebrating the 30th anniversary of the Wilderness Act. ($12.00)

Habitat Poster by Montana Fish, Wildlife and Parks. Poster that takes a deeper look at habitat and includes a activity relating to all the species in the poster. (free)

Water Cycle Poster by Soil Conservation Service, USDA. Poster that shows the water cycle and has activities on the back. (free)

Backcountry (Wilderness) Skills Trail Posters by Wasatche-Cache Nat. Forest. These posters focus on the principles of Leave No Trace and has a facilitated and a self guided version. Each poster can be a station that focuses on a specific backcountry skill. There are 9 posters in a set. ($40.00 for unlaminated, ungrommeted version.)

MAPS

National Wilderness Preservation System by BLM (free)

National Wilderness Preservation System (25th Anniversary) by Wilderness Society (free)

National Wilderness Preservation System by National Geographic Society ($.13)

BLM National Map by BLM. Shows BLM lands and contacts across nation. ($3.00)

NPS National Map by NPS. Shows National Parks across country and contact addresses. ($3.00)

USFS National Map by USFS. Shows National Forests across country and lists Forest offices addresses and phone numbers. (free)

NOTE: All of these maps are used for geography, history, and map reading lessons.

SKULLS AND PELTS

Beaver, coyote, bobcat, elk or deer, weasel. An excellent opportunity in discussions of adaptations and food chains... intriguing to kids of all ages, though young kids may have hard time conceptualizing their connection to animals.

Bobcat ($16.00)
Beaver ($16.00)
Coyote ($16.00)
Deer/Elk ($16.00)
Weasel/Muskrat ($16.00) TOTAL $80.00
(COLORADO SPECIFIC)

Beaver pelt. Great sensory item. Lends to discussions of history of fur trade or animal adaptations. ($25.00) (COLORADO SPECIFIC)

NOTE: First contact Forest Service, other agency, or state Fish and Game to see if they can provide the skulls you would like to have in your boxes. You may be able to get your skulls for free or at a low cost. They can also give you a name of private companies in your states that sell skulls and skins. It is very difficult to buy these items in one state and then ship them to another. Your best bet is to find a local contact and work from there. Check the vendor list for other sources.

AUDIOVISUAL MATERIALS

Slide show by Mary Beth Hennessy. Overview of wilderness with many slides specific to Colorado. Script for middle school and above, with adaptation for elementary students. (50 slides at .85 cents each to duplicate) ($42.50) A video is being produced in the region. (COLORADO SPECIFIC)

National Wilderness Slides provided by ACNWTC. These slides portray the diversity of the National Wilderness Preservation System and expose students to various values of wilderness. There is a introductory script to go with the slides. (68 slides at .85 cents to dup)($57.80) Slides are in plastic pages. Incorporate local slides. Duplicate starter kit box slides sent to each region and agency.

Slides of wildlife and wild scenes. For teacher or older students to compose own slide shows. #9,10,11,12,19 RM Wildlife #9 RM Birds ($1.50)

Last Parable video by Montana Department of Fish, Wildlife, and Parks. Wonderful footage with a good message. Works for most ages except young primary.($29.95)

Leave No Trace/Soft Paths video by NOLS. Fifteen minutes of people in wilderness and what to do there. Designed for older audience, though young kids seem to enjoy it also.($9.00)

A Kid For The Wild tape by Jim Stoltz. Available from Wild Wind Records, Box 477, Big Sky, MT 59716. Written and sung by a musician whose heart is truly in wild places. Great lyrics and very pertinent to wilderness and kids. ($10.00). There is also a Kid For The Wild song sheet in the box.

Wild By Law by the USFS. This video has the historical coverage of the conservation movement in American and the need and designation of wilderness. ($95.00)

Green Scene Video by USFS, Wilderness Society, and U. of Northern Arizona. This video accompanies the Green Scene curriculum and activities.(part of Green Scene curriculum cost)

Wolf Transparency by USFS/BLM. This transparency is the same wolf you will find on the Wildernss Wolf Poster. The collage of wilderness components outline the wolf. Works well on an overhead in the classroom.($2.50) The master is in your green scene curriculum.

Battle for Wilderness produced by WGBH/Boston, WNET/New York; Florentine Films: Larry Hott, Diane Garey, producers. This video is an hisorical recapitulation of the lives of John Muir and Gifford Pinchot, and the famous battle over Hetch Hetchy Valley in Yosemite National Park. (95.00)

PUPPETS AND MISCELLANEOUS

Five puppets by Furry Folk. They will sell at wholesale if it is an education project. Very life-like. Go for critters local to your area or wilderness dependent.

Beaver F1000 ($15.00)
Black Bear F1001 ($15.00)
Mole F1017 ($9.00)
Tan Rabbit F1009 ($15.00)
Squirrel F1014 ($15.00) TOTAL $69.00

Compasses - 6 are needed to teach map reading and orienteering. ($10.25 ea or $61.50 total) (type 7 #37054)

Contour plastic mountain kit Model is used for teaching map skills and contour lines. ($8.50)

Wild bag. A small feely bag with a variety of wild objects for discussion of sensory awareness. Contents of bag are 4 different pine cones, beaver chew, limestone fossil, deer pelt, and pyrite. Bag ($3.00), Contents ($5.00)

Rock collection and box. For geology lessons and because kids like rocks! ($8.95 for a bag of rocks)

Flannel Board-Flannel board with a map of the U.S. highlighting the wilderness areas across the country. There are pictures of animals, felt pieces of trees and cacti, settlement and building pieces and quote cards. There are also different pieces depicting user groups. ($15.00)

Oh Wilderness-the game of backcountry lore by June Fleming. A card game about backcountry lore: wilderness skills, wildlife, plants, land and sky. ($4.94)

CURRICULA AND PAMPHLETS

Wild Cards These laminated cards (21) contain phrases and words from the Wilderness Act. ($7.00)

The Green Scene by University of Arizona and partners. Six lessons about wilderness for 4th-8th grades. Comes with video. ($10.00)

Woodsy Owl EE Kit by USFS. For preschool, kindergarten to second grades. Good activities. ($5.00)

Leave No Trace, Skills and Ethics by NOLS. Small booklets of guidelines. (.75 each)

Leave no Trace Educational Materials Catalog. Leave No Trace, Inc. (free)

Wilderness Management Philosophy in Rocky Mountain Region by USFS and Cooperators. Everything you wanted to know about wilderness management and policy... and it is easy to read, too! (free)

Wilderness Quote Book by ACNWTC. A collection of wilderness quotes to be used in activites or read in the classroom.($6.00)

Wilderness/Land Ethics Curriculum by Pike San Isabel N.F. and ACNWTC. Each box contains 1 copy of the curriculum. ($9.00 per copy)

National Geographic Society Teachers Handbook by National GEO. A handbook with wilderness related activities. ($.75)

Women in Natural Resources - Vol. II, No. 3, March 1990. This publication focuses on women in the resource agencies involved in Wilderness. ($6.00)

PACKAGING

Large Rubbermaid Box holds curriculum, books, puppets, props, etc. ($22.00) Dimensions of box are 2'8" long, 16" deep, and 12" high

Small Rubbermaid Boxes 1 3 gal boxes to hold skulls. ($5.00)

Poster Mailing Tube Large poster tube for posters ($2.50)

Notebook for Puppet/ Slide Scripts Notebook to hold scripts ($3.50)

Notebook for Curriculum Notebook for lesson plans, worksheets, teacher information, etc. ($3.50)

Accordian Binder binder to hold maps, Green Scene activities, etc. ($4.00)

Tackle Box small tackle box to hold rock collection, about 18 to 20 slots. ($2.50)

Slide Protectors plastic protectors for wildlife and wilderness slides. 5 total ($1.00/ ea for total of $5.00)

Poster Lamination laminating all posters in the box ($2.00 ea for 16 posters/$32.00 total)

WHERE TO PURCHASE WILDERNESS BOX MATERIALS?

VENDOR:

Northwest Interpretive Association
909 First Avenue
Suite 630
Seattle, WA 98104-1060

MATERIALS:

1. Wildlife Post cards (3.00)
2. Words for the Wild by The Sierra Club Trailside Reader (12.00)
3. The Lorax by Dr. Seuss (12.00)

VENDOR:

Big Horn Booksellers
1019 Fox Hills Dr.
Ft. Collins, CO 80526
1-800-433-5995

MATERIALS:

1. The Wild Watch Book by Anne Armstrong ($9.00)
2. Signs Along The River by Kayo Robertson ($6.00)
3. Wildlife Post Cards ($5.00/set)

VENDOR:

Wilderness Society 202-833-2300 or 202-429-2648

MATERIALS:

1. Wilderness America: 25 years by the Wilderness Society (3.00)
2. National Wilderness Preservation System (25th Anniversary) ($.15)

VENDOR:

Rocky Mtn. Nature Association (RMNA) or other Interpretive Associations
Rocky Mtn. National Park
Estes Park, CO 80517
(303)586-1258

MATERIALS:

1. Wilderness America: 25 years by the Wilderness Society ($11.00)
2. Animal Friends of the Rockies by William Berry ($4.00)

3. Rocky Mountain Flower Finder (Pocket Guide) by Janet Wingate ($3.00)
4. Audubon Pocket Guide to Birds of North America by Audubon Society ($8.00)
5. Mountain State Mammals (Pocket Guide) by Ron Russo ($3.25)
6. Rocky Mountain Tree Finder (Pocket Guide) by Tom Watts ($2.00)
7. The Last Bit-Bear, A Fable by Sandra Robinson ($4.95)
8. Slide sets of Rocky Mtn. Birds and Wildlife: 9,10,11,12,15 & 19 ($1.50)
9. Colorado Magnificent Wilderness by John Ward ($14.95)

VENDOR:

Cover to Cover Bookstore
Table Mesa Shopping Center
Boulder, CO 80303
(303)499-5544

MATERIALS:

1. Wilderness America: 25 years by the Wilderness Society ($11.00)
2. My Side of the Mountain by Jean Craighead George ($5.00)
3. NOLS Wilderness Cookery by NOLS ($7.00)
4. Sharing Nature with Children by Joseph Cornell ($8.00)
5. The Lorax by Dr. Seuss ($12.00)
6. Animal Friends of the Rockies by William Berry ($4.00)
7. Lost Lake by Allen Say ($6.00)
8. The Other Way to Listen by Byrd Baylor ($18.00)
9. **Sand County Almanac by Aldo Leopold. ($10.00)

VENDOR:

Porcupines Unlimited Inc.
Shawn Ostwald
PO Box 20622
Billings, MT 59104
1-406-259-7552
OR
Eric Pocius
P.O. Box 568
Fairplay, CO 80440
(719)836-2623

MATERIALS:

1. Beaver pelt ($25.00)
2. Bobcat skull ($16.00)

3. Beaver skull ($16.00)
4. Coyote skull ($16.00)
5. Deer or Elk skull ($16.00)
6. Weasel or Muskrat skull ($16.00)

VENDOR:

National Park Service - 800-821-2903

MATERIALS:

**1. National Park Service - The first 75 years ($5.95)
**2. National Park Service National map ($3.00)

VENDOR:

Any Bureau of Land Management Office

MATERIALS:

**1. BLM National Map by BLM ($3.00)
**2. 1987 BLM National Wilderness Preservation System Map

VENDOR:

Boulder Bookstore
Village Shopping Center
1133 Pearl
Boulder, CO 80521
(303)447-2074

MATERIALS:

1. Words for the Wild by The Sierra Club Trailside Reader ($12.00)
2. A River Ran Wild by Lynne Cherry ($14.95) ($13.95)
3. Living Treasure Saving Earths Threatened Biodiversity by Laurence Pringle
4. 1 Book in CO Heritage Series by Sybil Downing ($)

VENDOR:

Mountain Press Publishing Company
P.O. Box 2399
2016 Strand
Missoula, MT 59806
1-800-234-5308

MATERIALS:

1. The Book of Fire by Willam Cottrell ($6.95) ISBN #0-87842-255-2

APPENDIX B

VENDOR:
Frey Scientific Company
Div of FSC Educational
P.O. Box 931026
Cleveland, OH 44193-1223
(419)589-1900
MATERIALS:
1. Contour Plastic Mountain Kit: order #08078 ($5.98)

VENDOR:
Trails Illustrated (Ponderosa Publishing)
P.O. Box 3610
Evergreen, CO 80439-3425
1-800-962-1643
MATERIALS:
1. Trails Illustrated Topographic Maps of wilderness areas ($6.95 each)
    - Shavano Peak #130
    - Collegiate Peak #129
    - Tarryall #105
    - Leadville & Fairplay #110

VENDOR:
Folkmans, Inc.
1219 Park Avenue
Emeryville, CA 94608
(510)658-7677
MATERIALS:
1. Furry folk puppets
    - Beaver: F1000 ($15.00)
    - Black Bear: F1001 ($15.00)
    - Mole: F1017 ($9.00)
    - Squirrel: F1014 ($15.00)
    - Tan Rabbit: F1009 ($15.00)

VENDOR:
Forestry Suppliers
P.O. Box 8397
Jackson, MS 39284-8397
1-800-647-5368
or
Army Navy Supply store
Missoula, MT 59801 406-721-1315

MATERIALS:

1. Silva Polaris Starter Compass (type 7) #37054 ($10.25)
2. Ditty bags 4x9 ($1.99)

VENDOR:

Government Printing Office
Attn: Charles Harper
Pueblo, CO 81008
(719)544-3142

MATERIALS:

1. Rocky Mountain Ecosystem Posters
   $5.00 small $5.50 large

VENDOR:

Recreation Equipment Inc. (REI)
4100 E. Mexico Ave. (Corner CO Blvd & I-25)
Denver, CO 80222
(303)756-3100

(PHONE ORDERING)
P.O. Box 1938
Sumner, WA 98390-0800
1-800-828-5533

MATERIALS:

1. Wild Bag ($1.99)

VENDOR:

Colorado Outward Bound School
945 Pennsylvania
Denver, CO 80203
(303)837-0880

MATERIALS:

1. Wilderness Ways by Lenore Anderson & Brian Litz ($7.00)

VENDOR:

Leadville Ranger Distict
Attn: Mary Beth Hennessy
2015 N. Poplar
Leadville, CO 80461
(719)486-0749/0752

MATERIALS:

1. Slide Show by Mary Beth Hennessy. This is being converted into a video in the Rocky Mountain Regional Office (USFS)

APPENDIX B

VENDOR:

Leave No Trace, Inc.
P.O. Box 18
Lander, WY 82520
(307)332-4784 or 307-332-6973 or 1-800-332-4100 (hotline)

MATERIALS:

1. Leave No Trace & Soft Paths (Videos) by MT Dept. of Fish, Wldlf & Parks ($19.95)
2. Leave No Trace Outdoor Skills & Ethics by NOLS ($175/set).
3. Leave No Trace Poster ($2.00)
4. Backcountry Skills Trail Posters ($150.00)
5. Leave No Trace Educational Materials Catalog (free)

VENDOR:

Wild Wind Records
P.O. Box 477
Big Sky, MT 59716
(406)995-4906

MATERIALS:

1. A Kid For The Wild (Video) by Jim Stoltz ($10.00)

VENDOR:

Any Forest Service Office

MATERIALS:

1. Woodsy Owl EE Kit
2. Wilderness Mngt. Philosophy in RM Region (Region 2)
3. U.S. Wilderness Map or Regional Wilderness Map
4. Wilderness Wolf Poster (may need to make copies, original not in print)

** 5. Centennial Mini Histories

6. Forest Service Forest ($3.00 each)

** 7. USFS National map (Free)

** 8. USFS Regional map (Free)

VENDOR:

Roberts Reinehart
121 2nd Avenue
Niwot, CO 80544
303-652-2921

MATERIALS:

* 1. Public Land, Public Heritage: The National Forest Idea by Alfred Runte (16.95)

VENDOR:

Acorn Naturalists
17300 E. 17th Street
Suite J-236
Tustin, CA 92680
(714)838-4888

or

Museum Products Co.
84 Route 27
Mystic, CT 06355
1-800-395-5400

MATERIALS:

1. Rock and Mineral Specimens #KFR-434 ($8.95/bag)

or

1. 35-piece Rock and mineral set- $8.95 or (12 0r more $8.05)

VENDOR:

Local Merchants (Small Business)

MATERIALS:

1. large Rubbermaid Tote for complete kit ($21.18)
2. small individual boxes for rock collection (Tackle box type) ($2.50)
3. binders for Puppet Scripts & Stories ($1.50)
4. slide protectors ($3.00)
5. arrowheads
6. stuff sack for puppets 9x13 (3.00)
7. ditty bags for wild bag 4x9 (1.99)
8. small rubbermaid tote for skulls (4.00)

VENDOR:

USDA Forest Service, Region One
Laird Robinson, Public Affairs Office
(406)329-3434

MATERIALS:

Fire's Role in Nature Poster

VENDOR:

Any Soil conservation Service office, USDA

MATERIALS:

** 1. Water cycle poster and curriculum (free)

APPENDIX B

VENDOR:

Arthur Carhart National Wilderness Training Center
20325 Remount Road
Huson, MT 59846
406-626-5208

MATERIALS:

** 1. Wilderness Quote Book ($6.00)
** 2. National Wilderness slides (call for masters to be duplicated)
** 3. Wilderness wolf poster is now out of print. This is the poster that has an outline of a wolf with many activities and animals inside.

VENDOR:

Arizona Board of Regents
School for Renewable Natural Resources
University of Arizona
Tucson, AZ 85721
(602)621-2211 or 621-7177

MATERIALS:

1. The Green Scene, curriculum and video ($10.00)
2. Wolf master for transparency.

VENDOR:

Montana Dept. of Fish, Wildlife & Parks
930 Custer Ave. W.
Helena, MT 59620
(406)444-2733

MATERIALS:

1. The Last Parable (Video) ($20.00)
** 2. Habitat Poster (Free)

VENDOR:

Direct Cinema Limited
PO Box 10003
Santa Monica, CA 90410-9003
1-800-525-0000

MATERIALS:

** 1. Video- The American Experience: Battle for Wilderness (95.00)
** 2. Video- Wild by Law (95.00)

VENDOR:

UC Bookstore or Local Bookstore
University of Montana
PO Box 5148
Missoula, MT 59806
406-243-4921

MATERIALS:

1. My side of the Mountain by Jean Craighead George (5.00)
2. A river ran wild by Lynne Cherry (14.95)

** 3. Wilderness Visionaries by Jim Vicary ($9.95)

** 4. Zoobooks - bear and eagle

VENDOR:

Ampersand Press
8040 NE Day Road West #5-A
Bainbridge Island, WA 98110

MATERIALS:

** 1. Oh Wilderness- the game of backcounty lore game by June Fleming (4.95)

VENDOR:

GSA Supply Facility
Fort Worth, TX 76115

MATERIALS:

1. Mailing Tubes for posters 24 x 2"
   8110-00-244-7435 ($.97)

VENDOR:

San Juan Interpretive Assoc.
Attn: Laurie Gruel
701 Camino Del Rio
Room 301
Durango, CO 81301 DG:R02F13A

MATERIAL:

** 1. 30th Anniversary Wolf Poster - (12.00) (if under 25 ordered)

VENDOR:
Stackpole Books
Cameron and Kelker Streets
Harrisburg, PA 17105
1-800-READ-NOW
MATERIALS:
** 1. Soft Paths by Bruce Hampton and David Cole (10.95)

VENDOR:
Dirk Essary
Ingram Distribution Group
1125 Heil Quaker Blvd
Lavergne, TN 37086-3650
1-800-937-5300, Ext. 6612
MATERIALS:

1. Book of Fire by William Cottrell Jr.
2. Lost Lake by Allen Say
3. My Side of the Mountain by Jean Craighead George
4. The Other Way to Listen by Byrd Bayor
5. Sharing Nature with Children by Joseph Cornell
6. Signs Along the River by Kayo Robertson

NOTE: If you FAX the order, you will be given 40-41% discount and no shipping charge if you call in the order, you will be given 38% discount, plus shipping charge.

VENDOR:
National Geographic Society
Geography Education Program
1145 17th St. NW
Washington, DC 20036-4688
Kari Gathen (202)775-6577 or FAX (202)429-5701
MATERIALS:

1. National Wilderness Preservation System Map ($0.13)(order in mulitples of 100 only
2. National Geography Teachers Handbook ($0.75)

NOTE: The Handbooks are in short supply

VENDOR:

WINR, Bowers Lab
University of Idaho
Moscow, ID 83843
208-885-6754

MATERIALS:

** 1. Women in Natural Resources Vol. 11, No. 3, March 1990, ($6.00)

WILD BAG

The wild bag is composed of:

1. 3 different types pinecones (gathered in the forest)
2. 1 ditty bag 4x9 to hold items (see local merchants)
3. 1 fur of some sort (we chose rabbit)(see skull vendor)
4. Beaver chew (found in the forest)
5. Pyrite (Frey Scientific)
6. Admetopsis (Frey Scientific)

The above items can be interchanged with items appropriate for your area.

NOTE: RMNA, Cover to Cover and Bighorn may provide discounts for book orders.

**** Prices will vary from year to year (these prices are from 92-93)

WILD CARDS

These are just words taken from the Wilderness Act and put on cards. You can use index cards or make cards with these words written on them. You may photocopy the cards in the starter kit boxes or make your own version on a PC.

FLANNEL BOARD CONTENTS LIST

Heavy gauge white flannel. The flannel board has an outline of the United States on it with Wildernesses marked in green. (1 yd X 1 yd)

Flannel board pieces:

Green pieces (Begin with these on flannel board)

(Laminated pictures with sandpaper on backside with green dot and green felt pieces)

Pictures

Florida panther
2 tipi s
1 Native American
wolf
Avocet bird
deer
turtle or tortoise
buffalo
great blue heron
black footed ferret
grizzly bear
1 duck

Felt pieces (green)

3 conifer trees
2 deciduous trees
1 cactus
1 shrub

Yellow pieces (Settlement)

(Laminated pictures with sandpaper on backside with yellow dot) and 1 brown felt railroad piece (cut out like a ladder) approximately 13 inches long 2 grey felt road pieces; each piece is approximately 11/2 inch wide. One piece is 5 11/2 inches long, one piece is 141/2 inches long.

Pictures

2 churches
2 houses
2 settlers
1 mountain man
1 train on a track

Red pieces (Uses)

(Laminated pictures with sandpaper on backside with red dot)

Pictures

2 horseback riders
1 fly fisherman
1 four wheeler
1 4x4 pickup truck
2 cross country skiers
1 family of hunters
1 people mountain biking
1 set rafters
1 crosscut sawyers
1 chain saw

APPENDIX C

Materials for the Flannel Board

1 sq yard heavy white flannel
1 slide of National Wilderness Protection System
Dowel rod
Sand paper
Fabric paint - black, green
Transfer pen/paper
Bag for all pieces

Total cost for all materials $15.00

FLANNEL BOARD STORY

A Story About...

Wilderness History and Philosophy

written by Sally Blevins and Rebecca Cothran

This is a flannelboard story. The flannelboard has an outline of the United States on it with Wildernesses marked in green. To begin with, pictures of trees, plants, and wildlife are attached to the flannelboard along with pictures of teepees. The kids participate by adding pictures and taking pictures off. Kids are given pictures that are labelled on the back.

NOTE: The spoken text is indented and information for the Leader stands out on the left margin.

Instructions for preparing materials:

* Buy white flannel large enough to draw on the US. Find 2 copies of the Wilderness map — Use a dark marker to outline the US and darken Wildernesses, too. You need 2 maps so you can draw on the lower 48 on one, and draw Alaska and Hawaii on the other. Put map on light table and flannel on top of it — outline the US in black and fill in Wildernesses in green permanent markers. PROTECT bottom of flannel piece by purchasing iron-on clear vinyl from fabric store, and adhering it. Mount flannel on plywood, or use with stretcher bars from art supply store.

* Cut out pictures from magazines, calendars, FS brochures, postcards, etc. to be parts of the story. This takes some time. If the picture isn't obvious as to how it fits in the story, label the back of it..."Mountain man", etc. I put that sticky acetate on both sides of the pictures and then glue on heavy sandpaper to the back so it will stick to the flannel — you might try other things - felt, etc. Also cut trees, grasses out of green felt. Roads from gray felt and railroads from brown felt.

HINT — color code the pictures for the different parts of the story by putting colored dots on the backs of the pictures BEFORE putting acetate on them. This makes it easier to sort pictures out when you put them away. Keep parts of the story in separate, color-coded, labelled baggies. Example: Put GREEN dots on pictures and bags used to begin the story — wildlife, teepees, trees...;

YELLOW dots on Settlement pictures — mountain man, covered wagons, log cabins, churches...

BLUE dots on Values pictures (IF you decided to use VALUES portion)

RED dots on Activities appropriate in Wilderness — hiking, horse-back riding, boating, hunting

FLANNEL BOARD DIRECTIONS

Second Option for Building a Flannel Board

1. Place slide of US map in projector backwards, so that the states are reversed. (Florida and the New England states will be on the left side of the map.) Adjust to size desired.

2. On a large sheet of paper, using a transfer pen, trace outline of the United States and also individual states. (Pen can be purchase at craft stores).

3. Lay outlined side down on fabric to be used. Iron according to directions on pen. You should be able to get about five transfers. If morr are desired, retrace over same pattern with transfer pen and repeat ironing step.

4. Using craft fabric paint (comes in plastic bottles with small tip) following pattern use black to outline states. Using wilderness map as a guide, fill in Wilderness areas using same paint in green. US Forest Service Wilderness Areas, National Park Service, US Fish & Wildlife Service and the Bureau of Land Management.

Figures

1. Find various clip art fom books, magazines, governemnt publications and scan them onto a computer.

2. Print out 5-6 per page

3. Color if desired

4. Laminate pages and then cut out

5. Glue sandpaper on back of figures

NOTE: Clip Art and Flannel Board Quotes are on the following pages

"I'm James Audubon. I study birds and I am finding that we are losing lots of forest habitat that is important to the birds and other animals."

"I'm George Catlin. I study and paint pictures of American Indians. I'm very worried about the disappearance of American Indians, buffalo, and the wilderness that is their home."

"I'm Thoreau. In wildness is the preservation of the world."

"I'm John Muir. Wilderness is a necessity — a fountain of life. Thousands of tired, over-civilized people are beginning to find out that going to the mountains is going home; that wildness is a necessity; that mountain parks and reservations are useful not only as fountains of timber and rivers, but as fountains of life."

APPENDIX C

JAMES AUDUBON

GEORGE CATLIN

THOREAU

JOHN MUIR

“I’m Rachel Carson. It is a wholesome and necessary thing for us to turn again to the earth and in the contemplation of her beauties to know the sense of wonder and humility.”

“I’m Aldo Leopold. I am interested in preserving wilderness for wildlife, but I am also understanding the importance of wilderness for humans. I think it is important for future generations to have opportunities to experience wild lands just as the early pioneers did.”

"I’m Chief Seattle. You must teach your children that the ground beneath their feet is the ashes of our grandfathers. So that they will respect the land, tell your children that the earth is rich with the lives of our kin. Teach your children what we have taught our children that the earth is our mother. Whatever befalls the earth, befalls the sons of the earth. The earth does not belong to man; man belongs to the earth. All things are connected."

RACHEL CARSON

ALDO LEOPOLD

CHIEF SEATTLE